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VOL. VI.—NO. 7. NEW YORK, FEBRUARY 15, 1862. NEW SERIES.

Improved Hotel Annunciator.

The old plan for calling servants in hotels to the rooms of guests, whenever they were needed, was to have a cord in each chamber connected to a wire which was led along the corners of rooms to the bar-room or office where it was attached to a bell, suspended on a spiral spring; each bell bearing a number corresponding to the number of the room with which it was connected. When a bell was rung the sound called the attention of the attendant, and the motion of the bell showed which of the bells was rung, and its number indicated the room from which the call came. But a few years since there was invented an instrument called an annunciator, by which the long row of bells along the edge of the ceiling was superseded by a neat square ornamental box standing by the side of the desk in the office. In this all the wires from the several rooms are connected with one bell, and each wire actuates a little disk or plate covering a number corresponding with the number of the room from which the wire is led, so that when the wire is pulled the disk falls and uncovers the number.

This plan is neater and more ornamental than the row of bells and has come into pretty general use, but it fails to save any labor on the part of the servants. It is still necessary for the servant to go first to the guest's chamber to learn what is wanted, and then to return below for it and to carry it up, making three journeys often over four or five flights of stairs before the guest can be served. The accompanying engravings illustrate a device for making known the wants of the guest by a single pull of the bell cord, so that the servant may take the article at his first journey to the chamber, thus serving the order in one-third of the usual time, besides saving the time and fatigue of the attendant.

The wire, *a*, Figs. 1 and 3, leads from the annunciator to the room of the guest, passing over a pulley at the room and descending vertically to the plate, *b*, Fig. 1, where it is attached to the slide, *c*. This slide traverses up and down the plate which is marked with the names of things most likely to be called for by guests, such as blanket, towel, water, fire, light, servant; and the list may be extended to include any other articles. In the office is placed the annunciator of which Fig. 1 represents a back view, and Fig. 2 a front view. The wire, *a*, coming from the chamber of the guest, is attached to the slide, *d*, Fig. 1, which slides along the rod, *e*, being drawn down in the position shown, by a coiled spring in the pulley, *f*. An elongated plate, *g*, is pivoted near its lower end to the slide, *d*, and has a pin projecting inward from its upper end to catch against the edges of the short plates, *h h*. When the guest presses down the slide, *e*, so far that the index will be opposite the word "blanket," the slide is drawn along the rod, *e*, just far enough to bring the pin upon the plate, *g*, to the upper edge of the lower plate, *h*. The plate, *g*, being hung upon a pivot near its lower end is bent aside as it moves along the rod by its pin pressing against the lower edge of the plate, *h*, and this pin is carried to the left hand end of the plate, *h*. When the slide, *d*, is released from its forward draft, it is drawn back by the force of the spring, *f*, and as it returns the pin catches on the upper edge of the plate, *h*, and slides along this edge from left to right; pushing the projection, *i*, before it. This projection extends through the instrument to the front side where it is joined to a sliding plate having the number of the room and the word "blanket" upon its face. This sliding plate is by the motion carried from under the cover which conceals it, and thus exposes to view the word "blanket," and the number of the room at which it is wanted.

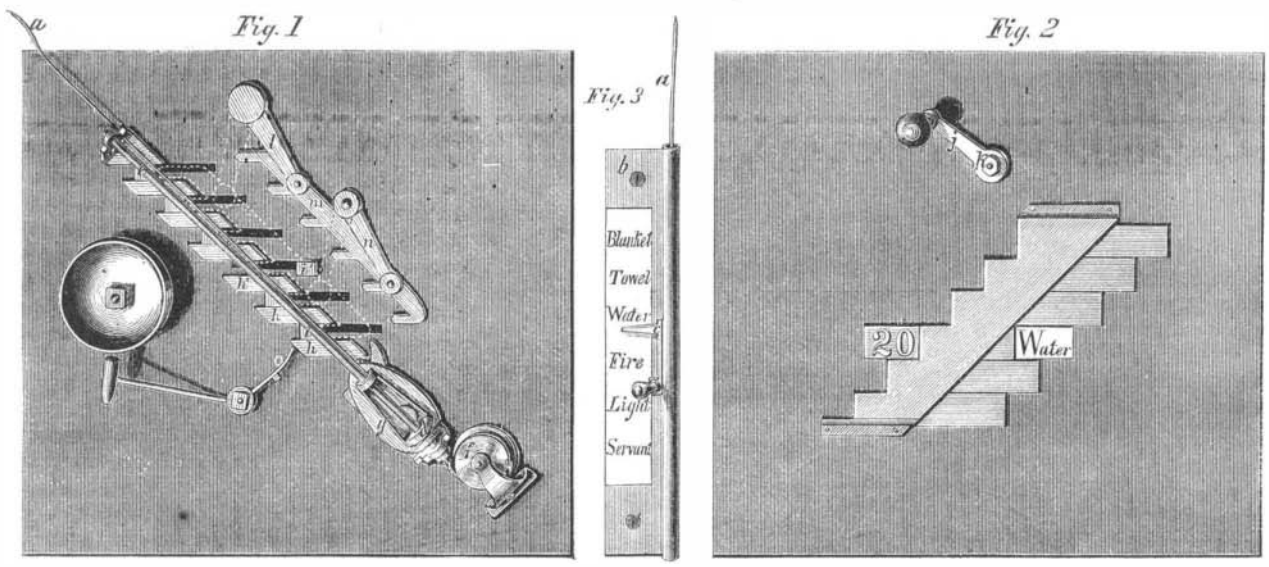
If the bell pull, *e*, is pressed down as far as the word "water," the pin upon the plate, *g*, is carried up the rod to the upper edge of the short plate, *h'*, and when released this pin carries the projection, *i'*, to the right, as shown, sliding its corresponding plate on the front of the annunciator from under its cover, and exposing the word "water," and the number of the room at which the water is called for.

The crank, *j*, on the front of the annunciator is attached to an axle, *k*, passing through to the rear, where it is secured to the lever, *l*. At the opposite end of this lever is pivoted the bar, *m*, which is also pivoted to a second lever, *n*, parallel with the lever, *i*. A partial turn of the crank, *j*, carries the bar, *m*, into the position indicated in the dotted lines, and pushes back the projections, *i i'*, to their places, thus sliding back the front plates with which they are connected behind the plate which conceals their words and numbers. This restores the apparatus to a condition ready for a second announcement.

It will be seen that a guest may call for one, two or more of the articles on the list to be brought at a single journey of the servant. As the plate, *g*, is drawn up the rod, it actuates the lever, *o*, and rings the bell, thus calling attention to the exposed plate.

This annunciator is operated by a single wire from each room, it is exceedingly neat and compact, and must save a great deal of labor in large hotels. It is also well adapted to transmit orders from one part of a vessel to another, and for communicating intelligence in manufactories, colleges and other places.

The patent for this invention was granted through the Scientific American Patent Agency, Dec. 17, 1861, and further information in relation to it may be obtained by addressing the inventor, J. H. H. Bennett, at Hunt's Hollow, N. Y.



BENNETT'S TELEGRAPHIC ANNUNCIATOR.

Making Steel from Iron with Gas.

About twenty-five years ago Mr. C. McIntosh, a manufacturing chemist in Glasgow, Scotland, made several tuns of cemented steel by submitting iron, at a dull-red heat, to the action of lighted gas, operating with from 100 to 150 lbs. at a time, the iron bars being two inches broad and quite thin. The cementation took from eighteen to twenty hours; and when the operation exceeded that time supercarburation took place. Thus by the sole action of lighting gas, without mixture of any foreign body, it is possible to obtain either steel or cast iron; it is only a question of time or temperature. To obtain steel there is no need to add ammonia previously in order to nitrogenize the iron. Steel and cast iron differ only in containing diverse proportions of the same elements, as pure white cast iron can be tempered and even forged like steel; witness the white cast iron of Lieges used for making screw plates.

The Fort Pitt Works, Pittsburgh, Pa., have made arrangements for turning out twelve mortars per week, each weighing eight and a half tuns. Large numbers of heavy Dahlgrens and Columbiads, and an immense quantity of shells, are also being manufactured at this establishment.

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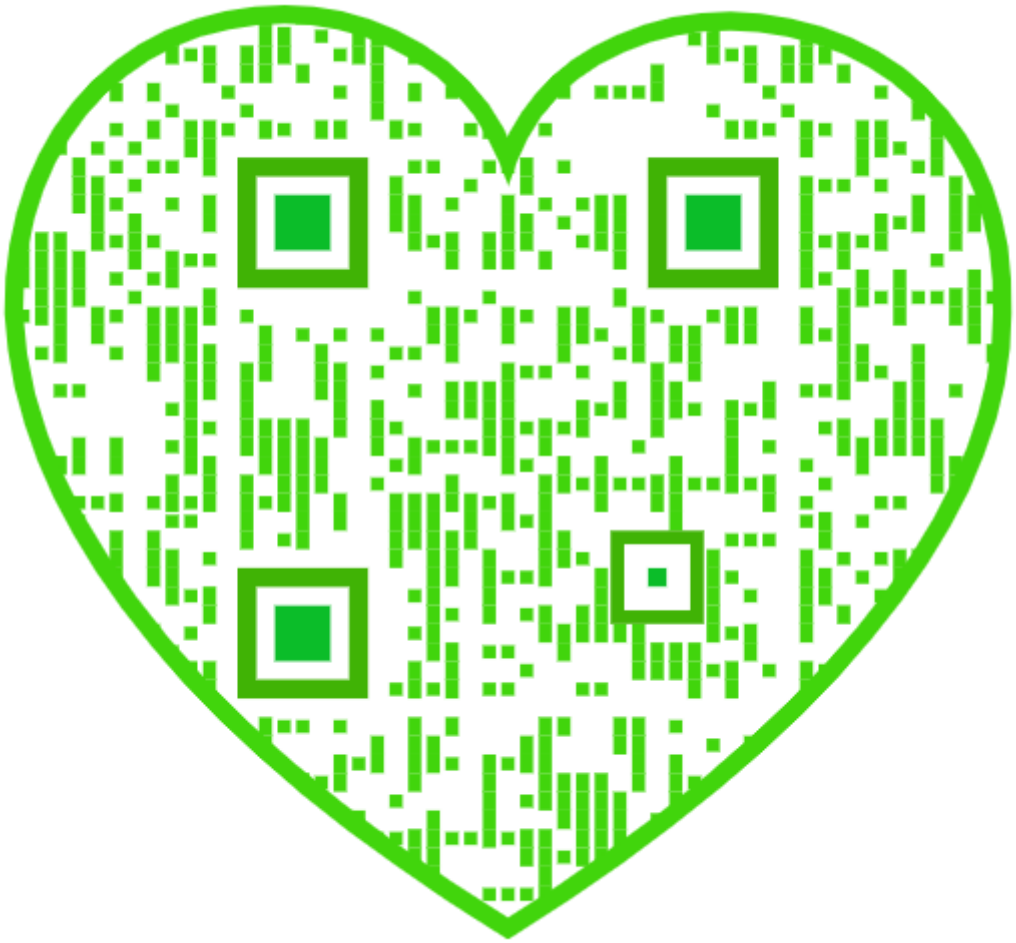

NOTES ON MILITARY AND NAVAL AFFAIRS

AFFAIRS IN MISSOURI.

There seems to be a head to military affairs in Missouri which is both wise and energetic. Major-General Halleck is evidently a man of great capacity, and thoroughly comprehends the work he has to do. He does not recognize the doctrine that the enemy is to be handled with velvet mittens, but believes in smiting them "hip and thigh," as Joshua did the Amorites. He has determined not only to shoot the bridge burners, but he is bringing the unarmed secessionists up to the ring. He has recently issued orders requiring the president, directors and all responsible employees of the various railroads in the State to come forward and take the oath of allegiance; also the president and professors of the State University, which was endowed by the United States to do the same. General Halleck intimates that he cannot allow treason to be taught in a University thus endowed. There was a recent split in the Chamber of Commerce in St. Louis, growing out of a hostile feeling between different members on the Union question. The Union members withdrew and formed a new chamber, leaving the secessionists to conduct their own chamber to suit themselves. Gen. Halleck, however, has notified the secession members that they will not be allowed to serve unless they take the oath of allegiance. He has also insisted upon the same conditions in respect to the directors and librarian of the Mercantile Library. General Halleck recently made a levy upon prominent secessionists to aid in supporting Union refugees who were driven from their homes by the rebel marauders. In one case, a man by the name of Engler sought, through his attorney, by writ of replevin, to recover his goods. General Halleck seized Engler and his attorney and shut them up, as a warning to all who would undertake to thwart his authority. He has now asked and obtained permission from the Government to expel from the city during the war some few hundred of the noisest secessionist who have made him a great deal of trouble. It is reported that his operations thus far have been attended with the happiest results. The peace, prosperity and happiness of Missouri are all bound up in the Union.

AFFAIRS AT THE SOUTH.

A solemn wail comes up from Cobb, Tombs and Crawford in an address to the people of Georgia. They say "our enemy has exhibited an energy, a perseverance and an amount of resources which we had hardly expected. . . . An immense army has been organized for our destruction, which is being disciplined to the unthinking stolidity of regulars. With the exclusive possession of the sea, our enemy is enabled to throw upon the shores of every State the nucleus of an army. And the threat is made, and doubtless the attempt will follow in early spring, to crush us with a giant's grash by a simultaneous movement along our entire borders. . . . With whatever alacrity our people may rush to arms, and with whatever energy our government may use its resources, we cannot expect to cope with our enemy either in numbers, equipments, or munitions of war. To provide against these odds, we must look to desperate courage, unflinching daring and universal self-sacrifice." Cobb no doubt remembers his operations in the Treasury, Floyd in the War and Thompson in the Interior Departments, *and wonders at the resources and energy of the people.* These patriots then proceed to advise that the women and children be supplied with firebrands "to burn the loved homes of our youth that the fields of our heritage may be made desolate." And this is the entertainment which Cobb, Toombs and their confreres have prepared for the people of Georgia, who were a year ago prosperous and great under the blessings of our Union.

Cannon are being manufactured at the Phœnix Iron Works, New Orleans, but the process is slow and the quality inferior. The testing is imperfectly done, and serious consequences will take place when they come to be used in actual service. F. W. C. Cooke is manufacturing muskets and pistols at his machine shops, but the quantity turned out weekly is small and the quality inferior. The prices of arms are very high, and the stocks held by dealers are entirely exhausted. The greatest security of metals of all kinds prevails, and the quality of iron used for cannon brings almost fabulous prices. They are dependent for iron on Tennessee, and the supply is not near by equal to the demand. A small quantity of lead had been brought from Mexico through Texas, and old pipe is being melted to supply bullets. Copper is exceedingly scarce and high. In some shells used by the batteries at Columbus, and which were manufactured at New Orleans, the fuses were made of lead. The firing caused the melting of the fuses before leaving the gun, and a number were wounded while standing around. Since then orders came to make the fuses of copper. Powder brings from $2 to $3 per pound, and is of miserable quality at that.

The greatest secresy is observed in all the military operations of the Confederates, and strangers are excluded at the point of the bayonet from the ship-yards and fortifications. The newspapers are not allowed to publish anything in reference to them. The newspapers are short of paper, and they make their appearance on half sheets of brown paper, and many are suspended.

EXPENSES OF THE WAR.

The greatest secresy prevails with regard to the operations of the Confederate Treasury, no report ever being made or even asked for. The only limit to the issues of its promises to pay is the capacity to print and sign them. Notwithstanding this unlimited scope of issue the Government owes large sums to contractors and others engaged in operations with it. Loud complaints are constantly being made of this, several millions being owed in New Orleans. Our informant, after a careful calculation on data obtained from the best sources, is convinced that the daily expenses of the war to the Confederate States, owing to the inflation of prices, and the corruptions of the government, is at the rate of over two millions of dollars a day, or fully equal to ours, while their entire army is not half of ours, and a navy they only have on paper and on the stocks.

AFFAIRS AT THE NORTH.

A flag of truce came in from Manassas to Washington on the 3d. inst. It is said to cover a message from Jefferson Davis to President Lincoln, announcing that if the Federal government permit the rebel bridge burners in Missouri to be hung, under the order of General Halleck, that the Federal prisoners—Colonels Corcoran, Lee, Wilcox and others, held as hostages for the safety of the pirates—shall be immediately hung in retaliation.

By the steamship *Nova Scotia*, which arrived on the 5th inst., we have news that the London *Times*, opposes England's interference in American affairs.

MANUFACTURE OF ARMS.

There are now employed in the United States Armory, at Springfield, Mass., 1,400 men. The number of guns fabricated during the last month was 10,500—the largest number ever made in one month. The whole number turned out from June 30, 1861, to Jan. 31, 1862, was 44,072. These guns were issued as soon as finished, and are now, most of them, in the hands of soldiers. The iron used in this armory for barrels was for several years imported from England, but the scalps are now made at Worcester, from ore dug in New York, on the line of the Western Railroad. Beside developing and encouraging home resources and industry, the American iron is found to be as good as the English. A new department, in charge of Capt. Balch, an ordnance officer, has been established at the Armory, called the New England Department for Carriage Contracts. Here are stored battery wagons, forges, saddle trees, and all the numerous tools and accouterments connected with a battery. This department has contracted within the last five months for 150 battery wagons, 150 forges, 1,000 carriages, 4,000 sets of harness, and 60,000 accouterments. The forges and batteries are manufactured at at Concord, Worcester, New Haven and Troy, and sent to Springfield to be packed with tools and spare parts to keep the batteries in order.

ERICSSON'S IRON-CLAD BATTERY.

Our readers will remember that we gave a full description of this battery on page 331 of our last volume; it was the first published account. She is now launched and rapidly preparing for sea, and Captain Ericsson says she will soon be placed under Confederate fire. He expresses confidence that she can sink the *Merrimac* in a given number of minutes; and in case he can't sink her in one hour, he can bang at her any number of hours, without any fear of her armament, until he does sink her. As for her battering ram, he has an impression that "two can play at that game," and he has no hesitation in challenging a game of this sort. It is intimated that he will seek occasion to try it before the batteries at Norfolk. That is just the place for such an experiment, or possibly Fort Pulaski at Savannah. If his floating battery will stand the hammering it would get at either place, he may consider its reputation and his own as an inventor in this department of science as established beyond any cavil. If it accomplishes what is expected of it, we shall have a tolerably effective defence to any of the mail-clad vessels in the English or French navy.

The New Iron-clad Gunboats.

From discussions in Congress the public has now obtained some information respecting the character of the twenty new iron-clad gunboats recommended to be built for the navy. On the 4th inst., when the bill providing for them was before the Senate, Mr. Morrill, of Maine, stated he had seen the plans of these boats; they were all alike, and resembled scows. They were to be one thousand tuns burden, and not intended to go out of sight of land. He asserted there were no rolling mills in the country which could do the work for them within a less space of time than twelve months. Mr. Hale said he was informed they could be built in five months, and were strongly recommended by the Secretary of the Navy. Mr. Collamer, of Vermont, asked if they were to be sea-going vessels. He was answered by Mr. Grimes, of Iowa, who said they were not intended for cruisers.

It appears to us that unless the new iron gunboats are designed and constructed so that they can be employed for cruising, and active war purposes as good sea boats, they will be of little or no use to the country.

Extraordinary Ductility of the Bessemer Steel.

At a recent meeting of the Manchester Literary and Philosophical Society Mr. Brockbank exhibited some samples of steel manufactured by Mr. Bessemer's process. These specimens have been bent and twisted cold, and showed a remarkable degree of ductility. He stated that the Bessemer steel was one of the most plastic and manageable of metals—more so even than copper. It could be bent, flanged or twisted, either hot or cold, without annealing, and over a considerable range of temperature—which is not the case with ordinary steel or copper. A plate of 18 inches diameter had been forced through a series of dies until it formed a tube 13 feet long and 1¾ inches diameter, without any crack or flaw. A ring of metal could at one heat be hammered into a die to form a locomotive engine chimney top. In drilling a circular hole into a plate continuous shavings are formed—whereas, in copper or Low Moor plates, or any other metal, the shavings break into pieces $\frac{1}{16}$th of an inch long. Thin sheets of the Bessemer soft steel can be bent backward and forward hundreds of times without a fracture, and are almost as malleable as paper.

Lumber Trade of Albany.

At Albany, N. Y., is the greatest lumber mart of the Eastern States; its condition is an index to the trade in general. The following tables in the Albany *Evening Journal* are a review of the trade for the past six years, and it shows that the business done last year was less than in 1857—the year of the panic:—

RECEIPTS DURING THE YEARS NAMED.

	Boards and Scantling. Feet.	*Shingles. M.*	*Timber. Cord Feet.*	*Staves. lbs.*
1856.....	223,345,545	36,899	14,539	102,548,492
1857.....	180,997,629	70,004	85,104	153,264,629
1859.....	267,406,411	31,823	119,497	135,011,817
1859.....	291,771,762	48,756	70,381	114,570,503
1860.....	301,022,600	41,222	46,888	148,735,369
1861.....	162,952,527	31,782	44,754	143,784,471

VALUATION OF THE RECEIPTS DURING THE YEARS NAMED.

1856.....	$3,573,529	$129,147	$2,616	$461,468
1857.....	2,881,560	248,515	15,218	689,691
1858.....	4,412,205	111,383	20,314	540,047
1859.....	4,887,177	170,646	11,965	458,282
1860.....	5,042,128	144,277	7,971	594,942
1861.....	2,729,454	111,237	7,697	575,138

SCREWING ON NUTS.—We have sometimes known nuts on thrashing machines, circular saws, &c., to be found so tight that no wrench would remove them. This was because they had been held in the hand till they became warm, and being then applied to very cold screws in winter, they contracted by cooling on, and thus held the screw with an immovable grasp. Always avoid putting a warm nut on a cold screw; and to remove it, apply a large heated iron in contact with the nut, so as to heat and expand it, and it will loosen at once—or a cloth wet with boiling water will accomplish the same purpose.—*Country Gentleman.*

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METALLURGY OF COPPER AND ZINC.

The following is the substance of three other lectures by Dr. Percy, of London, being a continuation and completion of the course which we published on page No. 51, present volume, as taken from the *Ironmonger* :—

In several parts of Italy they practice a peculiar process for obtaining copper from iron ores. The ore employed is an iron pyrites, containing a very small amount of copper, not more than two per cent; it is broken into lumps the size of the fist, spread on a layer of brushwood and ignited; when the whole takes fire, the sulphur burns with the evolution of sulphurous acid gas, the combustion of the heap continuing for eight or ten months. When the fire has burnt itself out it is found that the outer part of each mass consists of peroxide of iron merely, the whole of the copper being concentrated in a central kernel, which often is so rich as to contain 15 per cent of metal. The kernel, after separation from the surrounding mass, is smelted in the usual manner.

The working qualities of copper are greatly influenced by minute quantities of other bodies united with it. Phosphorus in very small proportions ensures a good sound casting, and the metal can be rolled when cold, but is brittle when hot, or, as it is termed technically, is red short. Copper containing so large a proportion as 11 per cent of phosphorus is hard, grey in color, and vere sonorous When copper is granulated, mixed with a large proportion of sand and charcoal, exposed to a white heat for three or four hours, it alloys itself with silicon, the basis of sand; these samples of silicated copper possess very remarkable properties. An alloy with 11 per cent of silicon is brittle, with two per cent the alloy is tough, strong and closely resembles gun metal, and promises to be of great value in the arts. The purity of the copper used in forming the conductors for electric telegraphs is a point of great importance, as the conducting power of copper is greatly lessened by even a small admixture of foreign bodies; taking the conducting power of pure copper at 100, a minute addition of metallic arsenic or of phosphorus lessens it to 6.

Zinc, which has only been obtained in a separate state within a comparatively recent period, was certainly known to the Romans, by whom brass coins were made 2,000 years since. Zinc in its ordinary state is a bluish white metal which is brittle at ordinary temperatures, but becomes malleable when heated, and if rolled in this state retains its malleability when cold, after which it may be bent without breaking and may be softened by annealing. On the contrary, it heated nearly to its melting point it again becomes brittle, and when bent crackles like tin. The melting point of zinc is about 800° Fah. At a bright red heat it takes fire if exposed to the air, producing white oxide of zinc; this, however, is yellow when heated, and may in this condition be often seen escaping from the chimneys of brass foundries. Oxide of zinc is largely used as a white pigment; united with carbonic acid it constitutes calamine. The chief ores of zinc are calamine and zinc blende. Calamine is a carbonate of the oxide. It was formerly so abundant in England that it has been exported as ballast. At the end of last century 1,500 tuns were yearly raised in Derbyshire alone; in 1859 the whole amount in the United Kingdom was 235 tuns, chiefly from Cumberland and Ireland. The chief continental deposits of calamine are in Belgium, Silesia and Carinthia. Recently, however, large and valuable deposits have been discovered in the north west of Spain. Blende, or sulphide of zinc, the "black jack" of the miners, is a combination of zinc and sulphur; its name is derived from the German ward *blenden*, to dazzle. It is a much more abudant ore than calamine. The first process in the reduction of the blende is that of roasting in the reverberatory furnace. This has the effect of burning away the sulphur, and the zinc remains in the form of oxide. This oxide is reduced to the metallic state by heating it in closed pots with charcoal or other carbonaceous matters, when the carbonic oxide produced absorbs the oxygen from the ore, and the metallic zinc, being converted into vapor by the heat, flies off through a tube and is condensed and collected. Formerly this process was followed very extravagantly. At Swansea, even quite recently, twenty-four tuns of coal were consumed in the reduction of one tun of zinc. An improved form of retort for effecting the reduction is now employed, and the cost has consequently been diminished to less than one-half of what it was formerly by the old furnaces. The improved method of reduction is termed Silesian. Furnaces acting on the same principle, but differing considerably in detail, are also employed in Belgium, at the works of the well-known Vieille Montagne Company. The consideration of the foreign materials always present in commercial zinc is one of considerable practical importance. Iron and zinc alloy readily, and the presence of a minute quantity of iron renders the zinc unfit for rolling. When iron is present, it is indicated by minute grey specks on the bright crystalline surfaces of a freshly broken ingot of zinc. When lead and zinc are melted together and cast, the lead always is found in greater quantity on the bottom of the casting, but zinc cannot be completely deprived of lead in this manner. The effect of the presence of lead on the quality of zinc is a matter of some dispute, some observers stating that its action is very detrimental, whilst others allege that the inferior quality of the zinc under experiment depends on the mode of working. In preparing ingots of zinc for rolling, the practice is to allow the lead to subside as completely as possible.

The combination of the two metals, copper and zinc, constitutes brass, an alloy which possesses very valuable properties; it is so malleable and ductile that it can be rolled into thin sheets, shaped into vessels under the hammer, raised by stamping, drawn into wire, cast at a lower temperature than copper, taking a sharp impression, and, lastly, it is of a pleasing color, and is cheap. So malleable is brass, that it may be beaten out into leaves not exceeding the $\frac{1}{52900}$ of an inch in thickness. The composition and qualities of brass vary very much with the purposes to which it is applied. Thus, the presence of a little tin is a good addition to brass used for door plates, as it causes the metal to break up short under the graver. Brass for turning has usually about 3 ounces of lead added to every 10 pounds, the addition being made after the crucible is removed from the furnace; the addition causes the turnings to leave the tool readily. Brass is very subject to a peculiar alteration in the arrangement of its particles, by which it becomes crystalline and extremely brittle—brass wire, brass chains, &c., often, without any apparent cause, lose their tenacity and become as brittle as glass; hence it is doubtful whether brass chains should be employed in the suport of heavy bodies, such as chandeliers.

The Affection of Hair Snakes.

Professor Agassiz, is writing a series of articles for the *Atlantic Monthly*, which are richly worth the subscription price of the publication. From the article in the February number we take the following extract :—

In the third division of the animal kingdom—the articulates—we have again three classes: worms, crustacea, and insects. The lowest of these three classes, the worms, presents the typical structure of that branch in the most uniform manner, with little individualization of parts.

This class includes animals of various degrees of complication of structure, from those with highly developed organizations to the lowest worms that float like long threads in the water and hardly seem to be animals. Yet even these creatures, so low in the scale of life, are not devoid of some instincts, however dim, of feeling and affection. I remember a case in point that excited my own wonder at the time, and may not be uninteresting to my readers. A gentleman from Detroit had had the kindness to send me one of those long thread-like worms (*gordius*) found often in brooks and called horse-hairs by the common people. When I first received it it was coiled up in a close roll at the bottom of the bottle, filled with fresh water, that contained it, and looked more like a little tangle of black sewing-silk than anything else. Wishing to unwind it, that I might examine its entire length, I placed it in a large china basin filled with water, and proceeded very gently to disentangle its coils, when I perceived that the animal had twisted itself around a bundle of its eggs, holding them fast in a close embrace. In the process of unwinding, the eggs dropped away and floated to a little distance. Having finally stretched it out to its full length—perhaps half a yard—I sat watching to see if this singular being, that looked like a long black thread in the water, would give any signs of life. Almost immediately it moved toward the bundle of eggs, and, having reached it, began to sew itself through and through the little white mass, passing one end of its body through it, and then returning to make another stitch, as it were, till the eggs were at last completely entangled again in an intricate net work of coils. It seemed to me almost impossible that this care of offspring could be the result of any instinct of affection in a creature of so low an organization, and I again separated it from the eggs, and placed them at a greater distance, when the same action was repeated. On trying the experiment a third time the bundle of eggs had become loosened, and a few of them dropped off singly into the water. The efforts which the animal then made to recover the missing ones, winding itself round and round them, but failing to bring them into the fold with the rest, because they were too small, and evaded all efforts to secure them, when once parted from the first little compact mass, convinced me that there was a definite purpose in its attempts, and that even a being so low in the scale of animal existence has some dim consciousness of a relation to its offspring. I afterward unwound also the mass of eggs, which, when coiled up as I first saw it, made a roll of white substance about the size of a coffee-bean, and found that it consisted of a string of eggs, measuring more than twelve feet in length, the eggs being held together by some gelatinous substance that cemented them and prevented them from falling apart. Cutting this string across, and placing a small section under the microscope, I counted on one surface of such a cut from seventy to seventy-five eggs; and estimating the entire number of eggs according to the number contained on such a surface, I found that there were not less than eight millions of eggs in the whole string. The fertility of these lower animals is truly amazing, and is no doubt a provision of nature against the many chances of destruction to which these germs, so delicate and often microscopically small, must be exposed. The higher we rise in the animal kingdom, the more limited do we find the number of progeny, and the care bestowed upon them by the parents is in proportion to this diminution.

Grain Laden Vessels Lost.

The *Journal of Commerce* states that during the month of December of last year, and thus far in January, "we have recorded the loss of some twenty-five grain loaded British vessels, going from New York to Europe, whose cargoes were insured on the other side. In every case these vessels were loaded by means of the elevators, and so rapid is this method, that but a few hours is necessary to load the largest class ship. The grain thus run in cannot be properly stowed by men in the hold, in consequence of the danger they run of suffocation from the grain overwhelming them, and from the dust arising from it, it being impossible for them to remain below longer than an hour at a time. It has no opportunity to settle or to become packed, as in the old style of stevedoring, and thus, when the vessel proceeds to sea, and is in motion, the grain shifts to leeward, almost invariably works through the ceiling into the pump wells, and so chokes up the boxes."

The idea conveyed by the foregoing statement, is that it is dangerous to the safety of vessels to be loaded by grain with elevators. This is a mistake. American vessels load in this manner and make as safe voyages as with any other cargo. The secret lies in loading them properly, and for this purpose the Board of Underwriters employ an experienced supervising agent to examine every American vessel loaded with grain in New York. There is no agent of Lloyds in this city, hence these British vessels which have been lost were not loaded properly; their cargoes shifted in severe weather and they became unmanageable wrecks. It is very difficult to load vessels with grain in bulk, and it would amply remunerate Lloyds to employ competent American agents in New York for the very purpose of examining all grain loaded British vessels.

A Connecticut correspondent writes that the culture of flax is beginning to be considerably agitated since cotton has gone up to 40 and 45 cents per pound. He says "New England can produce 400 lbs. of good, clean, swingled flax per acre, on moist, rich land."

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THE CHEMISTRY OF COAL.

Number IV.

ILLUMINATING GAS.

The principal instrument used for manufacturing gas is the retort. It is made of iron or clay, of semi-cylindrical form, about seven feet in length and one foot in diameter. A large number of retorts are set in brickwork, each group or bench of five having a furnace beneath in which a fire is kept constantly burning, to keep the retorts at a bright red heat. The retorts are made open at one end, but this end is supplied with a door. About 150 pounds of bituminous coal is placed in each retort, the door is closed and the joint is made airtight by luting it with clay. The heat immediately begins to decompose the coal, and its elements form new combinations, producing new substances. A portion of the carbon enters into these new combinations, but a large part, constituting about one-half of the weight of the coal, is wholly separated from the other organic elements, and as carbon cannot be evaporated by the most intense heat, it remains in the retort in the form of coke. The other new substances formed are volatile at various degrees of temperature, and are all evaporated by the heat employed to make illuminating gas. As they rise in the form of vapor they pass into a pipe, which leads them away for further manipulations, by which those suitable for illuminating purposes are separated from the others.

As the gas has to be conveyed in pipes which are partly buried in the earth and partly exposed in the open air to the varying temperature of the seasons, if it contains any substances which are not gaseous at the lowest temperature of our winter weather, these will condense and choke the pipes. The first step, therefore, is to remove all condensible substances from the permanent gases. This is done by passing the gas through the condenser, which consists of vertical pipes, standing with their lower ends in a vessel of water. All those substances formed by the distillation which are volatile at the temperature of 1,400°, and which enter into either the liquid or solid state at ordinary temperatures, are here condensed, and mingle together to form that dirty, viscid liquid called coal tar. This consists of a great number of hydrocarbons, which, from the peculiar, valuable and various properties they possess, are attracting a great deal of interest throughout the civilized world, and are destined to play an important part in human affairs.

A large quantity of ammonia is formed in the retort by the combination of the hydrogen of the coal with the nitrogen of the atmosphere, which flows into the retort when it is opened to receive its charge of coal. To separate this ammonia the gas is passed through a vessel called the scrubber. This is a large, upright cylinder, filled with large lumps of coke. The gas is admitted at the bottom, and a small stream of water is sprinkled in at the top. As the gas struggles up through the wet coke the ammonia is absorbed by the water—the apparatus being designed to expose a large surface of water to contact with the gas.

From the scrubber the gas is passed through a stratum of quick lime, which extracts the carbonic acid and the sulphide of hydrogen; and the purification is completed. It then goes to the receiver or gasometer, to be distributed through iron pipes to the burners where it is wanted.

Illuminating gas contains a small quantity of each of the three gases—hydrogen, nitrogen and oxide of carbon—but it is composed principally of a mixture of volatile hydrocarbons. It is stated in many works on chemistry that these hydrocarbons are marsh gas, $C H_2$, and olefiant gas, $C_2 H_2$; the former constituting about 80 per cent of the illuminating gas and the latter about 15. But the latest and best authorities say that the hydrocarbons of which gas is composed have never been satisfactorily separated from each other.

To Cure Sheep Skins with the Wool on.—Take one tablespoonful of alum and two of saltpeter; pulverize well and mix together thoroughly. Sprinkle this powder upon the flesh side of the skin and fold together with the wool out; hang up in a cool place. In two or three days, as soon as dry, take down and scrape the flesh with a blunt-edged knife till clean. This completes the process. Such skins make excellet saddle covers.

SURFACE CONDENSERS FOR STEAM ENGINES.

Number VI.

Fig. 14 is a section of a condenser adopted by Du Tremblay, of France. It provides for the expansion and contraction of the tubes, by forming a chamber on the tube plate, the upper end of which works in a stuffing box in the condenser case, thus allowing the tubes to expand equally. But as the expansion is very unequal (those nearest the steam inlet expanding most), this plan was found to be defective. Du Tremblay made his condensers with elliptical tubes. Fig. 15 represents a plan for obtaining extended cooling surfaces, by Mr. Davidson, of London. It consists of two sheets of corrugated metal, fastened together. A large cooling surface at a moderate cost is thus obtained. It answers well for a refrigerator.

Fig. 14.

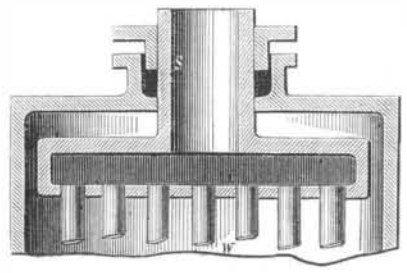


Fig. 15.

Fig. 16.

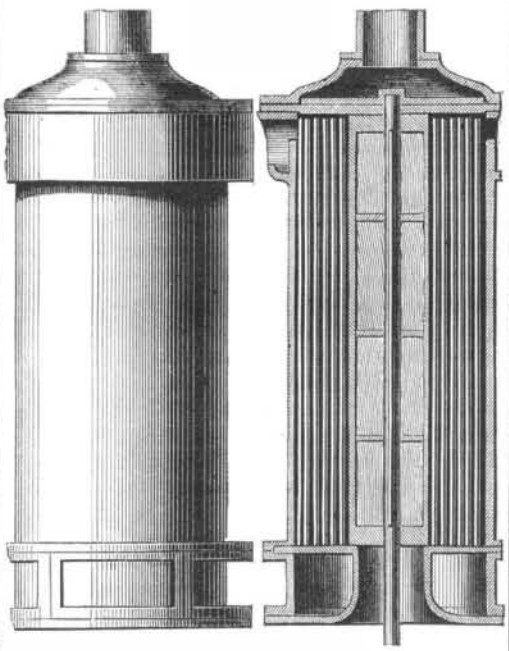
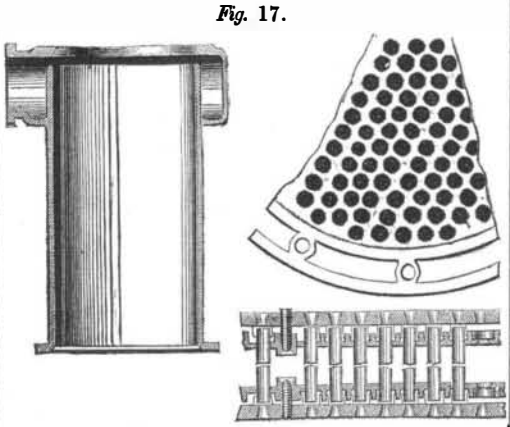


Fig. 16 is a condenser, adopted by Mr. Rowan, of Glasgow. It consists of a number of tubes, contained in a case, and surrounded with water, which is kept in motion by a fan or agitator. To this agitator s due the superiority of this over other condensiesr.

Fig. 17.



In early examples it was proposed also to mix air with the water, but this is not adopted in practice. The exhaust steam from the engine enters at the top. The water passes through a screen of wire gauze, to intercept all extraneous matter. The value of this screen was exemplified by the fact that, although placed, in early condensers, at an angle to give it more surface, it becomes, sooner or later choked, and another plan was adopted, shown in section, diagram 17, viz., of forming a lantern-shaped frame which, being covered with wire gauze, is placed on the end of the steam pipe, giving a much larger area of gauze, and that in a position not liable to get choked. The steam passing through the tubes is condensed, and the condensation water withdrawn by the air pump. The tubes pass through stuffing boxes. The packing used is a short length of india-rubber tube, lined with linen, to allow the tube to pass easily through without sticking. On these tubes are placed ferrules, pressed down to their places by plates, perforated to correspond to the tubes, which they also serve to keep in their places. Six or eight of these plates only are used to all the tubes in the condenser.

This plan of packing many tubes with one plate appears to me wrong in principle, as, in case the packing in one stuffing box was loser than in those on either side of it, it would be impossible to bring the plate down to bear on it.

Massachusetts Manufacturing News.

The *Commercial Bulletin* says:—We believe the largest and most complete works in this country for making split and ratan baskets by machinery are those of L. B. Williams, located at Huntington, Mass. These works employ from 70 to 85 hands, and turn out the enormous number of nine hundred to one thousand baskets of different kinds per day. Among the different varieties made are peach baskets, clothes baskets, market baskets, corn baskets of various sizes, factory baskets and hand baskets. About three-quarters of all the peach baskets used in this country come from these works. The style and workmanship of these baskets have been recently much improved, by improvements made in the machinery; and the advantage which they possess over those made by hand is their cheapness and uniformity of style and size, each size holding precisely what it is represented to hold, so that they may be safely used in all cases for measuring baskets. They are also made with direct reference to their shipment, and can be stowed in less than half the space of the ordinary kind. The business has been some eight or ten years gaining its present proportions, and the baskets from these works find a ready market in every important town and factory in New England, the great cities of New York, Boston and Philadelphia besides being shipped to the West in immense quantities.

The Balmoral skirt manufacture has become almost a speculative mania in Berkshire county. They are produced by hand and power looms both, and their superior texture and beautiful colors give them precedence in the market. The supply not being equal to the demand, not less than 86 new looms have been started on these goods, mostly at Pittsfield.

New Hampshire Factories.

The Manchester Print Works are running their machinery full time.

The Stark Mills are running two-thirds of their machinery four days in the week, consuming over 100 bales of cotton per week.

The Amoskeag are running their cotton mills on reduced time—use about 100 bales each week. On the first day of January they had 4,000 bales of cotton on hand, which stood them less than 12 cents per pound.

The great machine shop belonging to the Amoskeag Co., which, it is widely known, has turned out some of the best steam fire engines in use. In addition to this important branch, and other miscellaneous works they have a contract with the War Department for making 10,000 rifled muskets of the Springfield pattern.

To Prevent Tools from Rusting.—Thousands of dollars are lost each year by the rusting of plows, hoes, shovels, &c. Some of this might be prevented by the application of lard and resin, it is said, to all steel or iron implements. Take three times as much lard as resin, and melt them together. This can be applied with a brush or cloth to all surfaces in danger of rusting, and they can easily be kept bright. If tools are to be laid by for the winter, give them a coating of this, and you will be well repaid. It can be kept for a long time, and should always be on hand, and ready for use.

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THE GROWTH OF CORAL REEFS.

A LECTURE BY PROFESSOR AGASSIZ.

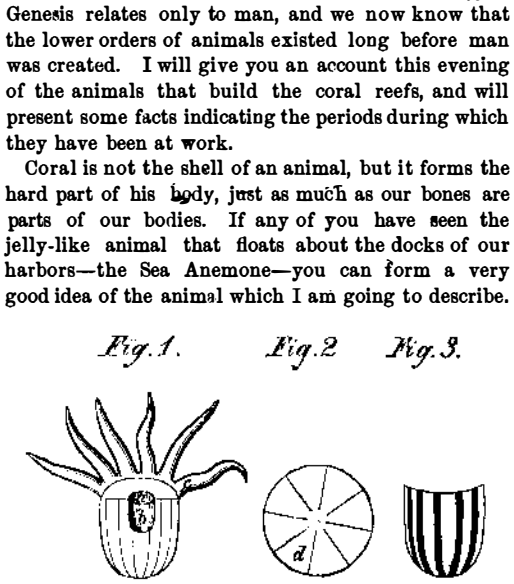
[Reported for the Scientific American.]

On Sunday evening, Feb. 2, Prof. Agassiz delivered the third lecture of his course on the goodness and wisdom of God, as manifested in his works. In this course he draws his illustrations from the science of zoology. In his first lecture he explained that the animals of the globe are divided into four orders, the simplest and lowest of which is the order of the Radiata. In these animals the parts radiate from a central vertical axis, like the spokes of a wheel which lies in a horizontal position. Of the three principal classes of radiates the lowest is the class of polyps, and the most interesting sample of these is that wonderful animal that builds the coral reefs. On being introduced the lecturer said :—

Accustomed to the narrow walls of a lecture room, I have never addressed an audience like this; and if I should not succeed in expanding my voice so as to be heard in the remotest parts of the building, I desire to apologize in advance.

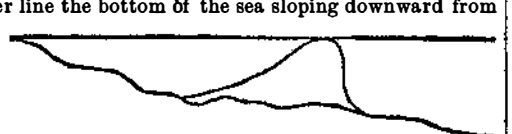
A question which excited the greatest interest a few years since, was in relation to the time at which animals first made their appearance on this earth. It was formerly supposed that we knew exactly how many years had elapsed since all animals were created, but on examination it is found that the chronology of Genesis relates only to man, and we now know that the lower orders of animals existed long before man was created. I will give you an account this evening of the animals that build the coral reefs, and will present some facts indicating the periods during which they have been at work.

Coral is not the shell of an animal, but it forms the hard part of his body, just as much as our bones are parts of our bodies. If any of you have seen the jelly-like animal that floats about the docks of our harbors—the Sea Anemone—you can form a very good idea of the animal which I am going to describe.



I will draw a rough representation of the coral animal upon the blackboard (see Fig. 1). These (*c*) are the tentacula, this (*a*) is the mouth, this (*b*) is the digestive cavity. These thin divisions (*d*) radiate from the center as shown in this cross section (Fig. 2); this structure placing the animal in the order of the Radiata, the lowest of the four orders; and it belongs to the lowest class in this order—the polyps. These tentacula are furnished with numerous minute hairs or cilia, which by their motion create a current of water into the mouth of the polyp, and thus draw in its food. The carbonate of lime which forms the durable part of the animal—the part with which we are all familiar—is drawn in by the animal with its food, and is secreted by its organs and deposited on the outer wall of its body and on these radiating divisions; thickening them in this manner (see Fig. 3). The soft parts of the polyp are capable of such variations in volume that they may be expanded to this extent (see Fig. 1) or contracted so as to be contained in this cavity in the upper portion of the cylinder (see Fig. 3).

Coral reefs are built in this form. The horizontal line represents the surface of the water, and this lower line the bottom of the sea sloping downward from



the shore. The reef you see is nearly vertical on the sea side, and considerably inclined on the side next the land. They are always commenced in water from 10 to 12 fathoms in depth, never more than 72 feet, never less than 60.

This statement may seem to conflict with that of Capt. Cook, that he brought up corals in the Pacific Ocean from a depth of 2,000 feet. But, though I have no doubt of the truth of Capt. Cook's statement, and though I know that mine is correct, there is no conflict between them. It is ascertained that the bottom of the Pacific Ocean is subsiding, and we know the direction of the subsidence. The corals that Capt. Cook recovered from so great a depth were the limestone remains of animals that had long been dead. They grew at the usual proximity to the surface, and were carried down with the settling of the ocean bed.

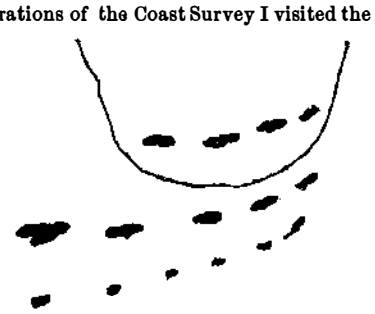
There are several species of corals, and each lives at a certain depth beneath the surface; being unable to exist either above or below the zone for which it is adapted. This is not strange when we consider the very soft character of its body, and the rapidity with which the pressure of water increases with the depth. At the surface there is a pressure of one atmosphere, at a depth of 32 feet a pressure of two atmospheres, and at a depth of 64 feet a pressure of three atmospheres, and this is as great a pressure as any of these animals can bear.

Each coral reef is built by four species of polyps; the bottom being constructed by the species which lives at the greatest depth, and the several parts above by species inhabiting corresponding strata of water. The reef builder lays the foundation at the base of the outer wall; and the growth is more rapid there than it is in the parts nearer the land. For this polyp is adapted to clean sea water, and will not live in the foul water inside the reef. The reef, therefore, soon assumes a form similar to that which it has in its finished state—the form indicated in the drawing. When the species of polyp that lives in water of 10 or 12 fathoms in depth has carried the structure up through the zone which it inhabits, his labors cease, and the work is continued by a second species. As this species does not require water so pure as the first he extends his growth toward the shore, thus sloping the reef as represented. Having grown upward through his stratum of water, his growth ceases, and a third and fourth species complete the reef.

It was at one time a mystery to us that one species could thus apparently grow out of another. But, in examining the mode of reproduction of these polyps, I discovered facts which explained the mystery. Though the mature animal is attached immovably to the rock, when first hatched he swims through the water, and is confined to the same stratum of depth as in the matured state. When swimming about in this undeveloped state, if he encounters the upper surface of a coral reef which has grown up to his stratum of water, he attaches himself to it and then begins to grow; thus continuing the structure.

These polyps multiply and grow by a process of budding. A protuberance appears upon one side of the body, which finally develops into a perfect animal; but is not separated from the parent, making a compound animal of numerous individuals united together. However strange this process may seem to us in the animal kingdom we are familiar with it in the vegetable. Each bud of a tree is a complete individual in itself, but they all unite to form a common plant.

The peninsula of Florida has been formed by these little animals, and they are still extending it southward toward the island of Cuba. In connection with the operations of the Coast Survey I visited the south-



ern part of Florida to examine the coral reefs, and I made some efforts to ascertain the rate of their growth. The foundations of Fort Jefferson, on Tortugas Island, and of Fort Taylor, at Key West, showed that the reefs had risen one inch in fourteen years. This would give in round numbers, after allowing for inaccuracies, say one foot in a century. This is doubtless more rapid than the actual growth, as the mass near the bottom is crushed together and compressed by the superincumbent weight, and it would probably take at least two centuries to grow one foot. But calling it one foot in a century it would take a reef sixty centuries, or six thousand years, to rise from a depth of sixty feet to the surface.

Let this indicate the outline of the southern end of Florida. Nearly parallel with the coast, diverging from it toward the west, is a row of small islands, called keys, and beyond these again a row of still smaller islands, which are called coral reefs. On examining the keys, too, they are found to be reefs of coral. Now, as the reef-building polyps can live only in the clean sea water, and perish if brought into the muddy water inside the reefs, we come to the conclusion that the keys were built up before the outer reefs were commenced. And if we allow the same rate of growth for them, their foundations must have been laid at least 12,000 years ago.

Along the coast is a marshy tract of land called the Indian Hunting Grounds, and beyond this, still parallel with the coast, is a row of low elevations called hammocks, rising some ten or twelve feet above the surface of the swamp, the mountains of that district; and these, on examination, are found to be still older coral reefs, carrying back our chronology another 6,000 years. Beyond these there is still another row, making 24,000 years.

The distance from the outer reefs to those last named is fifteen miles. I am told by intelligent officers of the army who have explored the country to Lake Okeechobee, sixty miles inland, that it is all formed of series of coral reefs. In fact, the whole peninsula of Florida is a coral formation, and we are brought to the conclusion that hundreds of thousands of years have been consumed in its slow growth.

And yet this is to-day in the chronology of our globe. The polyps that have built up Florida belong to living species. In the divisions of geologists this is the present formation. When we examine rocks formed by extinct species, we are led to a knowledge of periods still more inconceivable, during which nature has been conducting her operations.

DISCUSSION ON GUNPOWDER.

At the regular weekly meeting of the Polytechnic Association of the American Institute on Thursday evening, January 30th, the discussion was resumed on the subject of the application of chemistry to the military art—this subject having been continued from the meeting of the previous week.

Prof. Joy—Three years ago Mr. Bunsen, Professor of Chemistry in the University of Heidelberg, examined with great care the products of the combustion of gunpowder, and as the results were quite different from the statements of our text books, an account of them may interest this meeting. Bunsen found that of the substances formed by the combustion of powder, 67.7 per cent are solid, and 31.24 per cent are gaseous. The following is his list of both classes :—

PRODUCTS OF THE COMBUSTION OF 100 LBS. OF POWDER.

Solids.		
Sulphate of potassa	42.20	
Carbonate of potassa	12.60	
Hyposulphite of potassa	3.20	
Sulphide of potassium	2.10	
Sulphocyanide of potassium	.30	
Nitrate of potassa	3.70	
Charcoal	.70	
Sulphur	.10	
Carbonate of ammonia	2.80	
		67.70
Gases		
Nitrogen	9.90	
Carbonic acid	20.10	
Carbonic oxide	.90	
Hydrogen	.02	
Sulphide of hydrogen	.18	
Oxygen	.14	
		31.24
Total		98.94

As so large a portion of the powder is formed by combustion into substances which are solid, the gun would soon be completely filled up and rendered useless, were it not that most of the solids are thrown out by the expansion of the gases. Bunsen states the pressure at 4,374 atmospheres, 1,000 of which are due to the expansion by heat.

Bunsen's analyses of the powder which he used showed it to be composed of the following substances ;

Nitrate of Potassa	79.99
Sulphur	9.84
Carbon	6.69
Hydrogen	.41
Oxygen	3.07
Total	100.00

Prof. SEELY—I would ask Prof. Joy if the account gives the mode in which the powder was burned?

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Prof. Joy—It was shaken from the end of a whip stock into a retort in such a manner that one grain was burned at a time. The gases were drawn by an aspirator into tubes from which the air had been expelled, and the tubes were sealed until the gases could be examined.

Prof. Seely—Bunsen's analyses are exceedingly interesting and instructive, but they do not prove that our old notions of the combustion of gunpowder, when burnt in the usual way in a cannon, are erroneous. The mode in which he burnt his powder would necessarily give different products. As there was no pressure in his retort, the temperature was very much lower than that at which powder is burnt in a gun. It is a well known law that the products of decomposition by heat vary with the temperature, and the higher the temperature the simpler the compounds. If the quarternary compounds of Bunsen's list were produced at the low temperature of his retort, we should naturally expect at the higher temperature of the gun the binary compounds usually described. That there is bisulphide of potassium left in the gun we know by the smell and taste. We should certainly not find at this degree of heat so unstable a compound as the carbonate of ammonia.

Mr. Rowell—It is necessary to understand the office of the several ingredients of powder before we can obtain substitutes for either. The use of the sulphur is to kindle the mass. It burns at a low temperature and gives out little heat in burning, but sufficient to ignite the charcoal. Then the heat from the charcoal completes the combustion and expands the gases. In this friction match you know there is on the outside a little phosphorus, beneath that a little sulphur, and beneath the sulphur the stick of pine wood. The phosphorus in burning generates but little heat, the sulphur some more, and the wood more still. In this cup I have a little alcohol of 95 per cent. If I light the match and dip it immmediatly into the alcohol while the phosphorus only is burning, you see that the alcohol is not ignited, but the match is extinguished. But if I wait till the sulphur gets to burning then you see the alcohol is set on fire. The wood in burning generates more heat than the sulphur, and I have found that in lighting an oil lamp it is necessary to wait till the wood portion of the match begins to burn, the sulphur flame not being sufficiently hot for this purpose.

Prof. Seely—Mr. Rowell's experiment is a very beautiful one, and demonstrates in the most satisfactory manner the fact that the flame of phosphorus is less intense than that of sulphur. At first sight this fact might seem to form an exception to the general law that the heat generated by the burning of any substance is in proportion to the oxygen which it consumes; for, a given weight of phosphorus in burning combines with one-eighth more oxygen than the same weight of sulphur. The equivalent of phosphorus is 32, and in buring it forms phosphoric acid, $P O_5$. The equivalent of sulphur is 16 and in burning it forms sulphurous acid, $S O_2$. So that while 32 parts by weight of phosphorus combine with 40 parts of oxygen, 16 parts of sulphur combine with only 16 parts of oxygen. The explanation is to be found in the fact that the phosphorus flame is diffused through a larger space than the flame of sulphur; and, consequently, though the quantity of heat is greater, it is less intense. The power of heat to set any substance on fire depends upon its intensity.

Sea Birds.—The question is often asked where do sea birds obtain fresh water to slake their thirst? But we have never seen it satisfactorily answered till a few days ago. An old skipper, with whom we were conversing on the subject, said that he had frequently seen these birds at sea, far from any land that could furnish them with water, hovering round and under a storm cloud, clattering like ducks on a hot day at a pond, and drinking in the drops of rain as they fell. They will smell a rain squall at one hundred miles, or even further off, and scud for it with almost inconceivable swiftness. How long sea birds can exist without water is only a matter of conjecture; but probably their powers of enduring thirst are increased by habit, and possibly they can go without for many days, if not for several weeks.—*Wilson.*

Masses of platinum, weighing 53 ounces, are frequently smelted in 13 minutes by the oxhydrogen blow pipe, by Dr. Roberts, Dentist, New York.

Correspondence

Trial of Warlike Inventions.

Messrs. Editors:—It must be truly gratifying to many of the inventors of warlike weapons to have noticed in the Scientific American of the 25th inst. your opportune and pertinent remarks and suggestions under the above caption. Now that the Cabinet makers at Washington are being stirred up by the stern realities of war, and are busy in the manufacture of bureaus in the several departments, it is to be hoped that you will continue, through the Scientific American, to advocate and press the measure suggested, until Congress shall be induced to take up the subject and appoint the commission referred to. It is suggested, as an auxiliary in the furtherance of this object, whether the inventors themselves should not unite in concert of action, by petition or otherwise, to bring the subject tangibly before Congress. As pertinent to this question I have observed recently in some of the public papers the representation made by Charles Ellet, Jr., Civil Engineer, of the various and repeated attempts made by him to enlist the attention of the government in reference to his proposed plans and propositions for the construction of steam battering rams. While he has been knocking for admission at the several doors of the War and other departments, until his knuckles have become callous, and has abandoned the effort in despair, we find similar plans and purposes have been adopted in several European governments, and carried out for practical demonstration. The English government is rapidly augmenting its navy with iron-clad steam battering rams, and it is possible, unless the appearance of things now visible in the political horizon should change considerably, that some of these improved war vessels may be used to perform a new feat in naval tactics, viz., to charge bayonet, on some of our own (in this particular) defenceless navy. Is it not a little curious, to say nothing worse about it, that many very important and useful American inventions must become exotics before they can be relished and appreciated at home? Like the solanum of the aborigines of this country, their merits are not discovered until planted and raised in a foreign soil. Stevens's iron-clad battery, I believe, was originally devised and commenced several years before the English iron clad *Warrior* or the French *La Gloire* was thought of. The secretive and go-it-blind policy, however, adopted by the government in reference to the mode of constructing this vessel, has tended to place the navies of several foreign governments, in this particular, considerably in advance of our own. Had a commission, as proposed in the article above-referred to, existed years ago, whose duty it would have been to examine and test the plans and suggestions for the construction of this vessel in its incipiency, can we reasonably doubt that the final result would have been a vast saving to the government and an honor to the country? In many of the European governments large premiums are frequently offered to stimulate the inventive genius of the whole country. The difficulties encountered by Mr. Ellet, as above mentioned, is doubtless the experience of most of the inventors of warlike inventions in these troublous times of civil war and rebellion. All the departments at Washington, and especially the Ordnance and War Departments, are overwhelmed with business in the usual routine of their offices, and have no time to spare to investigate new plans or projects, however important and useful the same may be to the government in the prosecution of the present war. This state of affairs, we think, is a solid argument in favor of the propriety and necessity of the appointment of a commission, as suggested.

The improvement in projectiles, as described in the Scientific American, Nos. 25 and 26, Vol. V., I have thought contained the germ of novelty that might probably lead to some useful results in the science of gunnery. To project shot or shell to the greatest possible distance, or, in other words, to have guns, the range whereof should far exceed those of the enemy we supposed to be a great desideratum. Desirous that the United States Government might have the advantage of this improvement, should it, on a practical examination, be found valuable, the plan and description thereof have been communicated to several of the departments at Washington, but, I presume, as Mr. Ellet and a hundred others are before me, and as these departments may have adopted the barber shop rule—first come first served—I shall have to wait a little longer before I shall have the pleasure of hearing from them. The difficulty in testing my proposed improvements myself is the want of a suitable place where ample range for the purpose can conveniently be obtained. Around Trenton we have no place where a range of several miles could be obtained without great risk to life and property.

Charles Potts,
Civil Engineer.

Trenton, N. J., Jan. 31, 1862.

The Expansion Question.

Messrs. Editors:—I was much pleased to receive Mr. M'Elroy's reply, on page No. 5, this volume, Scientific American, to this question, but, although admitting the correctness of his figures in general I cannot bring myself to the belief that there would be a saving of 48 per cent by using the larger cylinder, as he has attempted to show. There is one point which Mr. M'Elroy seems to have entirely overlooked, viz., the difference in the displacement of the cylinders. The difference in the area of a 14-inch and a 22½-inch cylinder is 244. This multiplied by 300 feet will give 50.8 cubic feet of steam of 15 pounds pressure, or 152 cubic feet of steam of 50 pounds pressure per minute required by the larger cylinder over and above that required by the smaller one for displacement. This 152 cubic feet of steam added to the 165.79 cubic feet required by Mr. M'Elroy's figures, gives 317.79 cubic feet against 322.25 required by the smaller cylinder, showing a saving in favor of the larger cylinder of 1½ per cent only, and then not charging the larger cylinder with the increased cooling surface, friction of piston and its liability to a larger amount of leakage than the piston of the smaller cylinder.

If I have committed any error in this I should be glad to have it corrected, but, as it is, I think the question still remains open.

John West.

Norristown, Pa.

Sorghum in Ohio.

On the 7th ult. a sorghum convention was held at Columbus, Ohio. Fifteen splendid samples of sugar were presented, beside enough molasses to load a dray. The sugar was of very fine color and handsomely crystallized. From the discussions, it would seem that large numbers of cane growers had succeeded well in making sugar upon the Cook Evaporator, and, it is said, all the samples in the Convention were made on this evaporator. About 3,000,000 gallons of sirup were made in this State last fall, which has been sold at an average of 60 cents per gallon, or about $1,800,000! Many of those who tried succeeded in crystallizing their sirups in about 24 to 48 hours. One gentleman, Mr. Myers, of Springfield, said he had made 160 barrels, another 50, and so on. Mr. Myers also presented a specimen of wine equal to Madeira. A Committee was appointed to compile the most valuable information obtained for publication.

Silver Smelting in San Francisco.

Several American capitalists have invested largely in Mexican silver mines, and large quantities of silver ores have been imported into San Francisco where they can be smelted at less cost than in Mexico. Heretofore these ores have been admitted duty free, but lately the custom-house officers have adopted a new rule, and levied a duty of ten per cent upon them. This has drawn out a remonstrance from those who are engaged in smelting the ores. They state that while bar silver is admitted duty free, it is very unwise to levy ten per cent on the ore, as it gives employment to capital and a large number of persons in San Francisco; whereas, if they were smelted in Mexico their product would be admitted free. The amount of silver smelted from Mexican ores in San Francisco is about 16,000 ounces per month.

The Japanese government has officially signified its intention to forward articles to the great exhibition which is to be held at London next summer. The Ministers of Foreign Affairs, Koodze Gamatonskami and Ando Tsod Tsoosima Nokami, have written to the English Consul that "it would be a matter of great joy to cause the glory of Japan to sparkle in a foreign country."

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HISTORY OF THE HELIOGRAPHIC ART IN EUROPE AND AMERICA.

BY M. A. ROOT.

In entering upon this history, it may not be irrelevant to speak very briefly of the benefits which this art has bestowed, is bestowing, and will hereafter still more abundantly bestow upon the world.

And, first, it will serve to cherish and strengthen the social sentiments, from the fact that, at cheapest rates, kindred and acquaintances may have life-like portraits of each other perpetually by them. Upon this point I have dilated in another place.

Second, It is securing for us many of the results of various travel, and this at slight expense, without fatigue, trouble or peril, and even without crossing our threshold. The beauties and grandeur of our own and foreign lands; the most celebrated structures, secular and religious, in all quarters of the globe, and the far-famed ruins and relics of days long gone by; the portraits of heroes, saints and sages, ancient and modern, of distant countries and of our native land; all these, at a trifling outlay, we may have always present in our homes, thus possessing an inexhaustible source both of instruction and entertainment, as well as an efficient means of self-culture and refinement; while the speaking effigies of the great and good, who have heroically dared and done, and patiently and meekly endured, are constantly appealing to the higher and better elements of our nature with the whole mysterious potency of example.

Third, this art is working toward the grand result of universal peace and concord, the fraternal union and associative action of the race, by making men and women, however widely sundered by distance, to some extent acquainted with each other. We look upon the pictured fac-similes of all classes of the denizens of the frigid, the tropical and the temperate zones; and we look, too, upon vivid representations of their surroundings and their ways of life, and we thus learn as much of who and what they are, and how they live and act, as well nigh supplies the place of personal association. It is even found that the more thoroughly human beings understand each other and each other's mode of life, together with the reasons for the same, the more closely are they drawn together by reciprocal esteem and tolerance. In heliography, therefore, and its cotemporary discoveries, steam locomotion and the electro-magnetic telegraph, we behold three of the principal material agencies, whereby the hitherto jarring nationalities are to be brought into relations of fraternity and coöperative effort for mutual improvement and elevation.

Among the most extraordinary phenomena of modern days may be counted the rapidity with which the sun-painting art has been developed, and the great variety of applications, both useful and ornamental, which have already been made of it. But twenty years have elapsed since Daguerre made known his process to the world, and submitted to public inspection pictures which, in comparison with those now produced, would be called quite inferior, and even poor, and yet within this brief interval heliography has become one of the most valuable and generally-prized of existing arts. The beautiful toy, entitled the camera obscura, and the observation of the effects of the sunbeam on certain chemically-prepared surfaces, were the two main agencies to which the discovery of our art was due.

And here the reader will not merely excuse but thank me for introducing the following admirable extract from an unpublished lecture of Prof. John S. Hart, on "The Progress of the Age":—

> What would an ancient Greek have thought to see a puny mortal, more daring than Prometheus, making even the thunderbolts of Jupiter his toy? And what would even Franklin have thought to see the subtlest, fleetest, and most powerful of Nature's agents, not only stripped of its terrors, but made the submissive thrall, the obedient slave of man; doing his behests, running his errands, now gilding a child's toy, and now carrying a message to Congress, and exhausting in its flight even the language of metaphor, "as swift as lightning," it being no longer a comparison, now that lightning itself has become the agent of communication. But if Jupiter would have been astonished at the wonders of the telegraph, what would the sun-god have said to the not inferior wonders of the heliographic art? Apollo, indeed, knew himself of old to be the patron of painting; but did he ever dream that he would himself become the limner of half the human race? That those imponderable rays of his should, at man's leasure, be gathered into a brush of light, of inimitable truth and delicacy, wherewith to trace, with microscopic exactness, the lineaments of the human face?

The camera obscura was discovered about two centuries ago by Giovanni Baptiste Porta, a Neapolitan physician.

It seems strange that the ancient philosophers should not have observed and applied to some use the chemical properties of light, which are in many ways so obvious even to casual inspection. If they did so, no record of their proceedings has hitherto reached us. There is a tradition existing that the Oriental jugglers possessed for ages a secret process whereby they could rapidly transcribe a person's profile by the agency of light. Whatever the fact may once have been, this class of individuals are not known to possess any such knowledge now.

The alchemists of the middle ages, in their search for the philosopher's stone and the elixir vitæ, chanced upon a peculiar combination of silver with chlorine, an element with which they were unacquainted, and which they named horn-silver, from the resemblance borne to horn by the white precipitate obtained through fusion. As early as the sixteenth century they noticed that this silver was blackened by light; but as they failed to get gold as they expected from this substance, they merely recorded the blackening, without investigating the phenomenon further. The eighteenth century brought a more thorough examination of this curious fact; and about the same period the effect of light upon the crystallizing of various salts was first observed. In 1722 Petit published his investigations of this latter subject; while Chaptat published his in 1788, and Diezé his in 1789.

Scheele studied closely the phenomenon of the blackening of chloride of silver by light, more especially the influence of the several prismatic rays in producing this effect, and published the results of his studies in 1777. He discovered, among other things, that the violet ray wrought this change much sooner than any of the other colors. In 1790 Sennebier found that fifteen minutes' exposure to the violet ray imparted to chloride of silver the same blackness, which it required twenty minutes' action of the red ray to produce. In 1801 Ritter discovered that the chemical action of light extends beyond the colored rays of the spectrum, there manifesting itself through invisible rays.

In a recent publication of Lord Brougham he states that in 1796 he had published in the "Philosophical Transactions" a paper on light and color, containing remarks on the effects of exposing a plate of ivory, moistened with nitrate of silver, to the sun's rays passing through a narrow aperture in a dark room. The secretary of the Society, for reasons of his own, omitted these remarks, and thus, it may be, delayed the discovery of heliography for nearly half a century.

Scheele's researches, mentioned above, seem to have had a powerful influence upon the scientific world, for he was followed in the same or similar tracks of inquiry by numbers of the leading savans in all parts of Europe. Among these may be mentioned Berard, Seebeek, Berthollet, Wunsch, Sir Wm. Herschel, Sir Henry Englefield, Dr. Wollaston, Count Rumford, Morichini, Configliachi, Berzelius and that admirable specimen of womanhood, Mrs. Somerville. Sir Humphrey Davy also made some curious discoveries which, with those above named, constituted a mass of material which brought the world to the verge of the great discovery we are recording.

But the following experiment, detailed in sundry old books, is so definite in its forward-pointings, as to cause wonder that more was not made of it:—"Dissolve chalk in aquafortis to the consistence of milk, and add thereto a strong solution of silver. Keep this liquid in a well-stopped glass decanter; then cutting out from a paper the letters you would have appear, paste them on the decanter and lay the latter in the sun's rays, so that the rays may pass through the spaces cut out of the paper and fall on the surface of the liquid. Then will that part of the glass through which the rays pass be turned black, while that beneath the paper remains white. Special care, however, must be taken that the bottle be not moved during the operation."

(To be continued.)

THE most distinguished geologists in the world have come to the conclusion that at one period the action of fire was greater on the earth than it is at present. Sir R. Murchison says, "The nature, force and progress of the past condition of the earth cannot be measured by its existing condition."

Sugar.

Sugar is an important article of diet, and an aid to digestion. Though the use of sugar as an article of food seems mainly to supply the carbon used in breathing, yet it undoubtedly contributes also to the production of fat, for during the severe labor of gathering the sugar crop in the West Indies, in spite of the great exertion and fatigue, it is said that every negro on the plantation, every animal, even the very dogs, will fatten.

The conversion of starch into grape sugar, also appears to be the first step in its digestion; and it is probable that the greater difficulty with which cellulose converted into sugar, is the cause of its indigestibility and uselessness as an article of food. Sugar also plays an important part in many processes of the animal system, and appears to be necessary to the production of bile. It has been detected by Lehman and Bernard in the blood of man, and in that of the cat, dog and ox. As an instance of the marvelous processes going forward in the human frame, in the terrible disease called diabetes, all the amylaceous food converted into sugar, instead of being assimilated by the system, as in health, passes away, the sufferer thus deriving no benefit from the food.

Sugar lies under a ban for injuring the teeth; but the negroes employed on sugar plantations, who eat, perhaps, more sugar than any other class of people, have almost proverbially, fine, white, sound teeth, which they retain in old age. But, on the other hand, in England, persons employed in the sugar refineries, who are from their occupation obliged constantly to be tasting sugar, lose their teeth from decay after a few years. Sugar in combination with a small amount of alkali, has the property of dissolving phosphate of lime, which is contained in large quantities in the bone and teeth; a circumstance which may explain in some measure the contradictory nature of the facts. Owing to the present high prices of cane sugar, great efforts will be made this year to extend the culture of the sorghum and perhaps then some parties may try what can be done in the culture of the sugar beet and obtaining sugar from it.

Improved Grain Separator.

When wheat, rye, barley or other grain is first thrashed it is always mixed with other kinds of grain and with chess, the seeds of weeds, and other substances which must be separated from it to fit it for market. The accompanying engravings illustrate an apparatus invented for the purpose of this separation. It consists of a winnowing fan and two sets of sieves of different-sized meshes so arranged that the grain may pass over them in succession and thus be separated according to the size of the kernels into different parcels, each of which is conducted to its own receptacle.

The framing of the machine is constructed in the usual manner, and is closed in front and on two sides with the exception of openings in the latter to allow a current of air to pass into the fan. A is a hopper with downwardly-converging sides and inclined bottom, secured on top of the forward end of the machine and provided at its rear end with a seed aperture and sliding valve, *a*, for varying the size of the aperture and thereby regulating the flow of seed on to the sieves. This valve is moved up and down by a screw bolt, *b*, which has a winch on its upper end; the screw works through a nut, *c*, on the back side of the valve, *a*. A recess formed in the end of the hopper allows the nut to move up and down on the screw. B is a shoe suspended from the top and sides of the framing by four links, two on each side (shown in dotted lines in Fig. 1.) The front end of said shoe is partially closed by a board, *d*, and is entirely open at the bottom. The back end of this shoe has two troughs, A' B', one behind the other and inclining so as to discharge their contents on opposite sides of the machine as hereinafter to be more fully explained. *c f g* are sieves inclining rearwardly and secured equidistant apart in the upper part of the shoe. The back ends of these sieves empty into the inclined troughs, A' B', at the back end of the shoe. The front half only of the sieve, *e*, is punctured, the remaining half being smooth. The sieve, *f*, is offset in the middle and its entire surface is punctured somewhat finer than sieve *e*. The object of the offset is to allow an unperforated plate to be placed so as to cover the openings in the rear half of the sieve, *f*,

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HIGLEY'S GRAIN SEPARATOR.

Fig. 1.

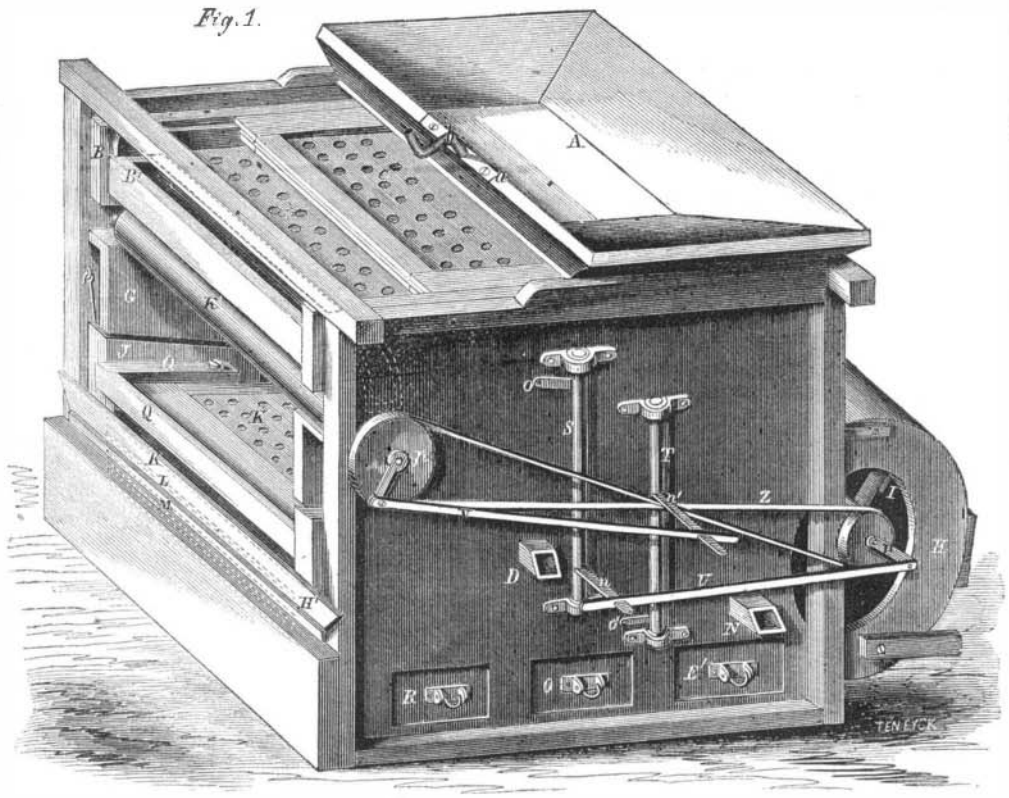
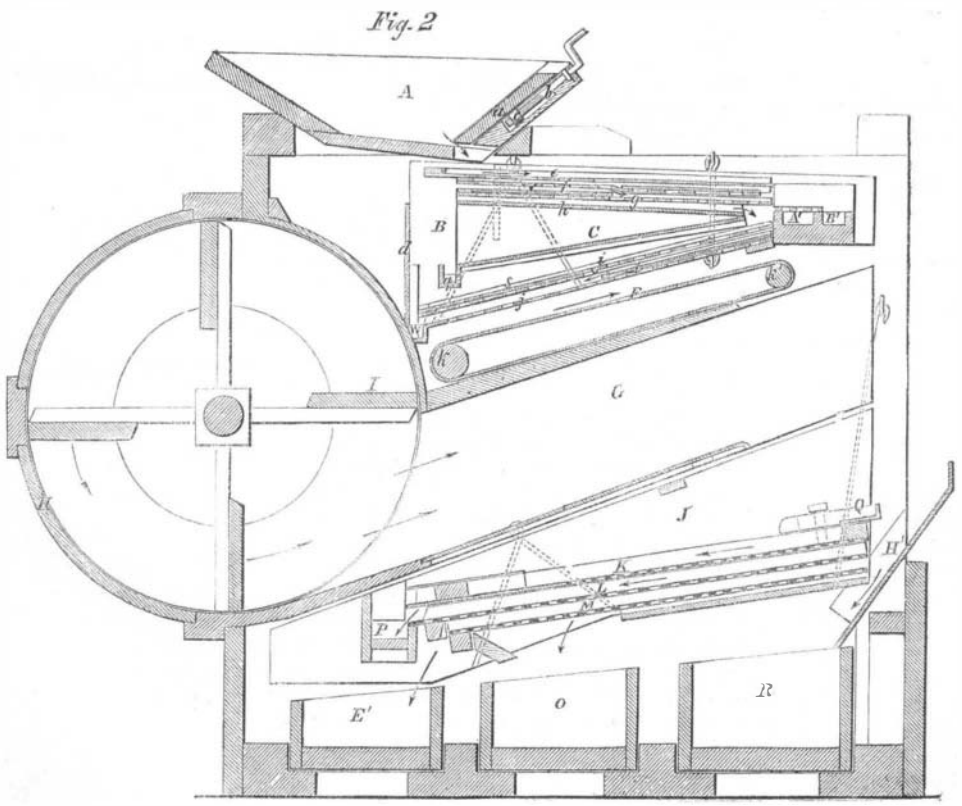


Fig. 2



and have the surface flush or level with the front portion of the sieve. Sieve *g* is punctured still finer than the one above it, and the front half of this is also covered with an imperforated plate, *v*. Immediately beneath the sieve, *g*, a fine wire sieve, *h*, is secured at each side upon wedge-shaped pieces, the points of which are toward the back end of the shoe. This fine sieve inclines in the same direction as the sieves above it. C is a the bottom of the shute or incline secured to wedge-shaped pieces and provided at its lower edge with a trough, *q*, inclining transversely to the shoe and discharging through the spout, B, (shown in dotted lines in figure 2.) *ij* are sieves punctured over their entire surface, the under one, *j*, being the finest. The lower half of the upper sieve, *i*, is offset and the openings in it covered by an imperforated plate, *s*, and the upper half of the under sieve is also covered with a similar plate, *t*. Both of these sieves discharge at their lower ends into an inclined trough, W, attached to the lower extremity of the board, *d*, which conducts its contents out at one side of the machine through spout, D. F is an endless apron which passes over rollers, *k k'*, from the latter of which it receives motion from the fan shaft, through the medium of a crossed cord or belt passing around a second pulley on one end of the roller and around a pulley on the fan shaft. G is an inclined trunk connected at its front end with the fan box or casing, H, in which a blast is created by the action of the rotary fan, the latter consisting of four radial arms secured to a shaft which is journaled in boxes attached to its framing outside of the fan casing. These arms are provided with wings having disk rings attached to their outer edges and fitted to revolve within the fan casing. J is a shoe suspended from the sides of the framing by links (shown in dotted lines.) This shoe is provided with three sieves, K L M, one of which, the upper one, is formed of a perforated metal plate, and the others are of wire matting or gauze, the bottom sieve being the finest. The upper sieve, K, discharges the grain at its lower end through a spout, N (shown in perspective in Fig. 1), the cockle and other refuse passing through the meshes of both the sieves under it into the drawer, O, and the small grain which falls on to the sieve, L, with the cockle passes over the lower end into the trough, P, thence it is conducted to one side of the machine. Q is an adjustable guard attached to the back end of the upper sieve so that it can be adjusted to project a greater or less distance over the edge of the sieve to catch the heavier grain falling from the apron, the lighter grain being blown against the inclined board, H', falls into the drawer, R. S T, Fig. 1, are two vertical shafts working in boxes at top and bottom attached to one side of the framing. Each of these shafts is provided with two arms, *n o n' o'*, placed at right angles to each other. The arm, *n*, is connected by a pitman, U, to a crank, *r*, on the fan shaft, and the arm, *o*, is connected to the shoe, B, by a short pitman, by means of which a vibratory shaking motion is imparted to the shoe. The shoe, J, is connected to the arm, *n'*, of the vertical shaft, T, which receives motion from a crank, *p*, through the medium of the pitman, V. The upper shoe being connected directly with the fan shaft, has double the motion of the lower shoe.

The operation is as follows:—The fan, I, being set in motion, and the grain placed in the hopper, the grain falls upon and through the openings in the upper sieve, *e*, through sieve *f*, on to the imperforated plate, *v*, of sieve *g*, thence it slides on to the wire screen, *h*, which separates the grass seed from it, the grass seed passing through the meshes of the screen on to the inclined bottom, *c'*, thence into the trough, *q*, whereby it is conducted out one side of the machine through the spout, D, the grain and cockle passing over the lower end of the wire screen, falls on to the upper end of sieve *i*, where they are separated from the oats, the latter passing over the imperforated plate, *s*, into the trough, and the seed and cockle passing on to the imperforated plate, *t*, of sieve *j*, thence through on to the endless apron, F. Any oats which chance to fall through on to this sieve are deposited iuto the trough, W, and discharged through the spout, D. The grain and cockle which fall on to the endless apron are carried up to the upper end and precipitated on to the sieve, K, in the lower shoe, at the same time the tailings are blown out by the blast created by the fan, I. The sieve, K, separates the seeds and cockle from the larger or seed grain, the latter passing out at the side of the machine through the spout while the former passes through the sieve and is separated from the cockle and discharged through the spout on the side of the machine opposite from where the seed grain is discharged. The cockle falls into drawer *o*, and any seed that has chanced to work through the cockle on to the sieve, M, passes over the end of the same into the drawer, E. The drawer, R, is to catch any grain that may be blown over the back end of the lower shoe, the grain striking against the deflector, H', is directed into the drawer. The trough, A', is covered with a sieve for the purpose of separating the oats that escape over the sieve, *e*, from straw and other refuse matter, the oats passing out of the same spout with those which pass through the sieves, the straw passing out of the trough.

In cleansing grain for the market the sieve, *k*, is removed and the grain allowed to fall directly on to the sieve, L. The object of the imperforated plates on one half of the sieves in the upper shoe is to have the grain fall from one sieve on to a smooth surface and then gradually slide on to the sieve instead of falling directly thereon. This allows the oats to lie flat in passing over the sieve, and thereby prevents them from passing through the meshes of the same. When it is desired to expedite the cleaning and separating process, these imperforated plates are removed; this allows the grain and refuse matter to pass through the sieves more rapidly, but the process of cleaning and separating it is not so thorough.

A machine constructed as above described is adapted to cleaning and separating all kinds of grain in the most thorough manner, the grain being separated and each kind deposited in its special receptacle.

The patent for this invention was granted through the Scientific American Patent Agency, December 3, 1861, and further information in relation to it may be obtained by addressing the inventor, Aaron Higley, at Sand Creek, Minn.

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CULPABLE LOSSES OF ARMY HORSES.

A mistaken notion prevails in the community respecting the losses sustained by the great number of horses which have died of disease in Washington, and those which have been sold, as diseased, for a few dollars after high prices had been paid for them by government. Many indifferent horses were undoubtedly purchased, but most of those which have died of disease, and those which have been sold as being useless for the army, were in good condition when purchased, and the loss which government has sustained by them can be traced to bad treatment.

The horse is an animal of fine organization and he requires to be nearly as well treated as his rider. In all nations where large standing armies are maintained, the governments support veterinary schools, from which competent surgeons are obtained for cavalry regiments. The horses of such armies are as well cared for as the soldiers. They have hospitals, good stables, and they are well fed and kept scrupulously clean. As the mounted troops hitherto required by our government have been few in number, no extended system, embracing the care of large numbers of horses was adopted; and under the altered circumstances of the present momentous war crisis, no proper head seems to have been selected to systematize and carry out measures for the organization of a large and efficient cavalry department. Many thousands of horses were purchased in the Northern and Western States and sent to Washington, where they were exposed for a long time to very inclement weather without stables, blankets or sufficient food of a proper quality.

Horses, like human beings, are very liable to become sick by a change of climate and water for drinking. This sickness will only last for a few days if the animals are properly treated, after which they will become acclimated and remain healthy with ordinary care. If they are not properly treated when first taken sick the disease is liable to become chronic and ultimately fatal. This was the case, we have been assured, with great numbers of the army horses sent to Washington.

It requires a mind of no ordinary grasp and experience of no common kind to superintend the army department relating to the horses of the cavalry, artillery and baggage trains. With respect to details, it appears that the right man has not yet been put into the right place, as it is reported by the newspapers that the horses of the army on the Potomac are now dying off daily in scores for want of proper care and provender.

Judging from the appearance and conduct of the majority of persons who are employed to take care of horses, it appears to us that a woful delusion is prevalent respecting the qualifications necessary for the performance of such duties. Any man capable of measuring out a peck of oats, carrying a pailful of water, or tumbling in a bundle of hay and throwing out a heap of manure from a stable seems to be held competent to take care of a horse, whereas it requires a man of good judgment, much patience, firmness, intrepidity, kindness and careful habits to take this charge. There is a sad deficiency of such characters connected with our cavalry departments.

The most gross negligence and incompetence have also been displayed in shipping numbers of valuable horses by sea, on expeditions down the Southern coast. Of 130 excellent horses sent from Boston to Ship Island, 68 were lost during the voyage, owing to the improper method of packing them on board. Their flimsy stalls broke down when the ship labored in the sea, and the animals were dashed from side to side kicking and trampling one another to death. During the Crimean war the steamer *Himalaya* transported from the 1st of June to the middle of October, 1856, 3,000 horses, out of which only 3 were lost. In fitting up this vessel the platforms of the stalls were raised two inches off the deck, to admit of cleaning, draining and washing. Each horse had a separate stall, the sides and ends of which were of plank, and padded with cowhide stuffed with straw. The horses wore canvas head-stalls, and sling eyebolts were fastened to the deck, over the center of each stall, by which the horse was supported with a wide band of canvas under his belly whenever his situation required it. No such precautions were provided for the shipping of our horses; hence the great loss which has been sustained.

PROFESSOR AGASSIZ IN BROOKLYN.

The late Augustus Graham, of Brooklyn, in addition to other charitable bequests, left in the hands of trustees a fund of $12,000, with directions that the interest should be expended for popular lectures of a character somewhat similar to the Bridgewater treatises. The will prescribes that the lectures shall be "On the Power, Wisdom and Goodness of God as manifested in his Works," that they shall be delivered in Brooklyn on Sunday evenings by the most eminent masters of science that can be procured, and that they shall be free to all. The course delivered winter before last was by the Rev. Dr. Huntington; the course last winter by J. P. Cooke, Professor of Chemistry in Harvard University, and for the course this winter the trustees have been so fortunate as to enlist Professor Louis Agassiz.

It is well known that heretofore Prof. Agassiz has refused to deliver popular lectures, saying that his life was devoted to enlarging the boundaries of knowledge, and that he should leave to others the labor of its dissemination. But from his writing popular articles for the *Atlantic Monthly*, and consenting to deliver this course of lectures, it seems that he has changed his determination. It is with the highest satisfaction that we welcome the entrance of the greatest master of science in the world upon the field of that labor to which the SCIENTIFIC AMERICAN is devoted—the diffusion of a knowledge of science among the great mass of the people.

The first two lectures of Agassiz's course were delivered in the small hall of the Brooklyn Institute, but so many who went were unable to procure admission, that a successful effort was made to obtain the Academy of Music for the remaining four lectures. The third lecture of the course was delivered on Sunday evening, Feb. 2, and the spacious building was crowded from parquette to ceiling with as respectable and intelligent an audience as is gathered there on opera night. In the natural order of the course the theme happened to be one in which Professor Agassiz is especially interested, and he treated it in a manner so methodical and clear as to charm the attention and command the comprehension of every person in the house. A report of the lecture will bo found on another page.

HISTORY OF HELIOGRAPHY.—On another page will be found the first of a series of articles we intend to publish on the above-named very interesting art, from the pen of M. A. Root, whose brief biography appeared in our last issue, under the title of "Fortunes and Misfortunes of an Artist." Mr. Root is about to publish a very useful and interesting treatise on the heliographic art, and the articles which will appear in these columns are extracts from the forthcoming work.

CHOOSING COTTON SEED.—A correspondent of the *Prairie Farmer* exhorts the farmers in Southern Illinois who intend to go into cotton planting next season to be very careful in the selection of seed. Sea-island cotton requires nine months of hot weather to mature to a full crop. The seed of this quality must not be used, but only that which is grown in the most northerly parts of Tennessee.

THE EXPLOSION OF GUNPOWDER.

On another page will be found a very interesting discussion on gunpowder by some of the best chemists in the city, and as they allude to the usual explanation of the matter we will give the explanation as we understand it.

Gunpowder is composed of five elements, all in the solid state, but by fire they are combined in new forms, by which about six-tenths of the mass is converted into gas; the chemical changes generating an intense heat. This change into the gaseous form causes an enormous increase in the volume, which is still further augmented by the rise in the temperature, and the ball is thus driven out of the gun.

Gunpowder is made by the combination of three substances, niter, sulphur and charcoal. Two of these, sulphur and charcoal, are simple elements, while the third is a compound substance. Saltpeter is the nitrate of potash and is composed of one equivalent of nitric acid, and one equivalent of potash. Potash, or potassa, is composed of one equivalent of the metal, potassium, and one equivalent of oxygen. Nitric acid is composed of one equivalent of nitrogen and five of oxygen, NO_5. The symbol of potassium is K, from the German name of the metal, Kalium. So the formula for the nitrate of potassa is KO, NO_5, and it will be seen that it is composed of three elements, nitrogen, oxygen and potassium.

The best gunpowder contains to the 100 pounds of niter, 17.76 pounds of sulphur, and 15.86 of charcoal, or carbon. This is precisely one atom of nitrate of potassa to three atoms of carbon and one atom of sulphur. And this, by being decomposed at the high heat which is generated when the powder is burned in a gun, is converted into one atom of sulphide of potassium, one atom of nitrogen and three atoms of carbonic acid,

$$KO, NO_5 + C_3 + S$$

becoming

$$KS + N + 3CO_2$$

It will be remembered that the atomic weight of potassium is 39, of sulphur 16, of nitrogen 14, and of oxygen 8. In this case 100 parts by weight yield 59 parts of gas; and one volume yields 300 volumes; the sulphide of potassium being a solid, and nitrogen and carbonic acid being gases.

MALLEABLEIZING CAST IRON.

Malleable iron is more generally understood to be cast iron, which has been subjected to a roasting deoxydizing process, without being fused, by which it becomes soft and tough. Formerly, wrought iron was called malleable, because the art of softening and toughening cast iron was then unknown, but wrought is now understood to be purified iron, capable of being rolled, forged and welded under the hammer.

The great genuine improvement, in the treatment of cast iron to render it malleable, was made by Samuel Lucas, of Sheffield, England, who obtained a patent in 1804, and his process is the one which is in general use at the present day for the same purpose. The articles of cast iron to be malleableized are placed in a suitable furnace with a layer of sand between them to prevent them from adhering, then they are covered with a pulverized oxide of iron, and subjected constantly to a high but not fusing heat for about six days and nights, then allowed to cool very slowly. The theory of the process is that the excess of carbon in the cast iron which renders it so hard and brittle unites with the oxygen of the pulverized iron ore in the furnace and passes off as carbonic acid gas, leaving the iron soft and malleable without changing its form. This was one of the most valuable discoveries ever made in metallurgy. It is now extensively practiced as an especial branch of art in every civilized country. Most cast iron articles intended for bridges, carriages, or for any purpose where they are to be subjected to vibrations are malleableized. Cast iron nails can be rendered so soft and tough by thus treating them, that they may be clinched almost as easily as those made of wrought iron. In 1838 Charles Burjot obtained a patent in England for treating raw pig iron with a mixture of the oxyde of manganese and charcoal in powder, in a furnace whereby he obtained malleable iron. The pigs were laid in alternate layers in a furnace with the mixture of manganese and charcoal between them, then they

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were kept at a red heat for two or three days, and subsequently left to cool in the furnace for three days. The second process is a mere modification of the first. Cast iron articles, without being melted or having their form altered are thus rendered malleable.

Wrought iron is incapable of being melted and cast, but by mixing it with three times its weight of pig iron it will fuse under a strong heat and may be cast and annealed. Castings possessing the same properies as those of malleable iron may thus be obtained, but unless made of cheap scrap iron they would cost more than castings entirely of pig iron malleableized.

ENAMELING IRON.

Enameling iron is almost a new art. No metal is capable of receiving a coating of vitrified porcelain or enamel unless it is capable of withstanding a red heat in a furnace. Articles of cast iron, as a preparation for enameling, are first heated to a low red heat, in a furnace, with sand placed between them, and they are kept at this temperature for half an hour, after which they must be allowed to cool very slowly, so as to anneal them. They are then subjected to a scouring operation with sand in warm dilute sulphuric or muriatic acid, then washed and dried, when they are ready for the first coat of enamel. This is made with six parts, by weight, of flint glass broken in small pieces, three parts of borax, one of red lead and one of the oxide of tin. These substances are first reduced to powder in a mortar, then subjected to a deep red heat for four hours, in a crucible placed in a furnace, during which period they are frequently stirred, to mix them thoroughly; then toward the end of the heating operation the temperature is raised, so as to fuse them partially when they are removed in a pasty condition and plunged into cold water. The sudden cooling renders the mixture very brittle and easily reduced to powder, in which condition it is called frit. One part of this frit, by weight, is mixed with two parts of calcined bone dust, and ground together with water until it becomes so comminuted that no grit will be sensible to the touch when rubbed between the thumb and finger. It is then strained through a fine cloth, and should be about the consistency of cream. A suitable quantity of this semi-liquid is then poured with a spoon over the iron article, which should be warmed to be enameled, or if there is a sufficient quantity the iron may be dipped into it and slightly stirred, to remove all air bubbles and permit the composition to adhere smoothly to the entire surface. The iron article thus treated is then allowed to stand until its coating is so dry that it will not drip off, when it is placed in a suitable oven, to be heated to 180° Fah., where it is kept until all the moisture is driven off. This is the first coat; it must be carefully put on, and no bare spots must be left on it. When perfectly dry the articles so coated are placed on a tray separate from one another, and when the muffle in the furnace is raised to a red heat they are placed within it and subjected to a vitrifying temperature. The furnace used is similar to that used for baking porcelain. This furnace is open for inspection, and when the enamel coat is partially fused the articles are withdrawn and laid down upon a flat iron plate to cool, and thus they have obtained their first coat of dull, white enamel, called biscuit. When perfectly cool they are wet with clean soft water, and a second coat applied like the first, but the composition is different, as it consists of 32 parts, by weight, of calcined bone, 16 parts of China clay and 14 parts of feldspar. These are ground together, then made into a paste, with 8 parts of carbonate of potash dissolved in water, and the whole fired together for three hours in a reverberating furnace, after which the compound thus obtained is reduced to frit and mixed with 16 parts flint glass, 5½ of calcined bone and 3 of calcined flint, and all ground to a creamy consistency, with water like the preparation for the first coat. The articles are treated and fired again, as has been described in the preparation coat, and after they come out of the furnace they resemble white earthenware. Having been twice coated, they now receive another coat and firing, to make them resemble porcelain. The composition for this purpose consists of 4 parts, by weight, of feldspar, 4 of clear sand, 4 of carbonate of potash, 6 of borax, and one each of oxide of tin, nitre, arsenic and fine chalk. These are roasted and fritted as before described, and then 16 parts of it are mixed with the second enamel composition described, excepting the 16 parts of flint glass which is left out. The application and firing are performed as in the other two operations, but the heat of vitrification is elevated so as to fuse the third and second coats into one, which leaves a glazed surface, forming a beautiful white enamel. A fourth coat, similar to the third, may be put on if the enamel is not sufficiently thick. The articles may be ornamented like china ware, by painting colored enamels on the last of the coats, and fusing them on in the furnace. A blue is formed by mixing the oxide of cobalt with the last-named composition; the oxide of chromium forms a green, the peroxide of manganese makes a violet, a mixture of the protoxide of copper and red oxide of lead a red, the chloride of silver forms a yellow, and equal parts of the oxide of cobalt, manganese and copper form a black enamel when fused. The oxide of copper for red enamel is prepared by boiling equal weights of sugar and acetate of copper in four parts of water. The precipitate which is formed after two hours moderate boiling is a brilliant red. The addition of calcined borax renders all enamels more fusible.

MORE ABOUT NOVA SCOTIA GOLD FIELDS.

A pamphlet on this subject has just been issued by Dr. Gesner, of this city, as a communication to the London Geological Society. On page 7 present volume SCIENTIFIC AMERICAN we presented some extracts from an article, by Mr. O. C. Marsh, on this subject. Dr. Gesner has visited the mines, and this pamphlet is the result of his labors and observations. In a geological sense it is interestng.

In the central portions of Nova Scotia there are extensive ranges of granite and other rocks varying in hight from 500 to 1,000 feet above the level of the sea. Metamorphic rocks of great thickness lean against the granite, and these are succeeded by the silurian and coal formations and trap rocks. Dr. Gesner informs us that "the gold has only been discovered in the metamorphic rocks which touch the granite on one side and the silurian on the other." At Tangier gold was accidently discovered, in 1860, in a small stream flowing into the Atlantic about fifty miles from Halifax. Gold is found in this place in quartzite, metamorphic clay, and greywacke. In form it resembles rough, feathery metal obtained by pouring any molten metal among cold water. The average yield of gold to the tun of ore is not stated, but about 600 miners were employed at this place last summer. Seven other diggings were visited, but the description of Tangier would nearly apply to them all, with the exception of "The Ovens," which seems to be a curious place. The name has been to the given locality on account of large and peculiar excavations made in the rocks by the sea. They are formed in a peninsula which is about one mile in length by a half in breadth, jutting out into Lunenburg Bay. The precipices are about fifty feet in hight above the water, and the southern side of the peninsula is principally composed of metamorphic slate containing thin seams of quartz in which the gold is found mixed with sulphurets of iron, mispickel and mica. In one of the caves in "The Ovens" considerable quantities of gold have been washed by hand from the sands on its floor. The amount of gold obtained at this place, without machinery, from June to December, 1861, was valued at $120,000. It varies in size from small spangles up to rough pieces about the size of a walnut. By Dr. Gesner's essay Tangier gold contains 96.50 of pure metal and 2. of silver. The gold of "The Ovens" contains 93.06 of gold and 6.60 of silver.

Of the gold-yielding rocks of Nova Scotia Dr. Gesner says:—The Province contains an ample amount of the precious metal to warrant most expensive operations and the construction of machinery for its mining and purification.

ACCORDING to the London *Times* one serious defect, of an almost if not quite irremediable character, exists in the construction of iron-cased ships, as constructed at present, and is fully exemplified in both the *Warrior* and *Black Prince*. This evil is the penetration of water between the teak and armor plates. This water naturally forces for its exit a passage between the joints of the armor plates, and the opinion at present is that nothing can remedy this under the circumstances of tongued and grooved-edged plates hung on a ship's sides by through bolts. Caulking is stated to be useless, and that cannot be wondered at considering the slung weight to be dealt with, and the ship's motion at sea. But the effect of the action of the water in the grooves of the plates and upon the iron bolts can only be expected to be such that in four or five years from the time of commission each ship will require replating.

THE COMPARATIVE ECONOMY OF STEAM AND WATER POWER

A correspondent writes from Wisconsin asking our opinion in relation to the comparative cost of steam and water power.

A few years ago the proprietors of whale ships in New Bedford, seeing that their business was likely to be ruined by the manufacture of lard oil, cast about them for some other investment by which they might keep up the prosperity of their town. Among the plans suggested was the erection of cotton manufactories to be driven by steam; but the very obvious objection occurred that it would be impossible to run steam mills in competition with those driven by water in which there was no current expense for power. At that time General James was receiving large pay for superintending the erection of cotton manufactories, and on being consulted by some of the New Bedford capitalists, he wrote a plausible pamphlet to prove that steam was cheaper than water! This pamphlet was loaned by one of the schemers to Mr. Rhodes, a very clear headed business man of large wealth, who had not heard much of the discussion, having been absent on a tour through the West. When Mr. Rhodes returned the pamphlet, the lender asked him what he thought of it. He replied,

"Oh! it is conclusive. He makes out his case. By the way, did I tell you my experience in Cincinnati when I was there?"

"No, Sir."

"When I landed in Cincinnati the shops were all closed and I supposed at first that it must be on account of the funeral of some prominent citizen. But the drays were rumbling about the streets, persons were going into and coming out from the stores, and everything seemed to be in activity, so that I was quite puzzled. Finally, I went into a large store, and found it brilliantly lighted with a great number of lamps, and ladies busy as possible buying goods. I asked the proprietor what it meant. He looked up and asked me what I referred to."

"Why," says I, "this closing your shutters and lighting up your stores with lamps."

He straightened up, and staring me in the face with the greatest astonishment, replied,

"My friend, is it possible that you have lived to this age, and don't know that lard oil is cheaper than daylight?"

SULPHUROUS ACID AS A DISINFECTANT.

There are three classes of disinfectants; the first removes offensive odors by absorbing them, the second by destroying them, and the third prevents their formation. The most powerful of the first class is charcoal, of the second chlorine, and of the third sulphurous acid.

The decay of vegetable matters is generally effected by the absorption of oxygen from the atmosphere. Sulphurous acid has a very strong affinity for oxygen, and when it is present the oxygen combines with it instead of combining with the organic substance, and thus the decay of the latter is prevented, or, at least, retarded. In other words sulphurous acid acts as an antiseptic. This is not the case with either charcoal or chlorine; neither has any tendency to preserve substances from decaying. If a piece of meat which has begun to spoil is buried in charcoal it will soon taste and smell perfectly sweet, but its decay will not be retarded. Charcoal is not an antiseptic.

Sulphurous acid acts as a disinfectant not merely by preventing the formation of offensive odors. There is a class which it destroys, some by taking out their oxygen and thus decomposing them, and others by combining with them and forming new substances.

For use in stables probably the best disinfectant known is sulphurous acid mixed with magnesia. While it has a very powerful action in keeping the air sweet, it is perfectly dry and consequently not injurious to the feet of the horses, and it does not impair the value of the manure.

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SALTING STREETS—THE SCIENCE OF THE QUESTION.

The practice of salting the tracks of city railroads, whereby they have been kept in a state of cold slush during winter, has called forth the wisdom of various city magistrates and others in exposing the evils, or supposed evils, arising therefrom. The Common Council of Philadelphia, having referred this subject to a committee, they have called in scientific experts to give testimony, a course altogether beneath the wisdom of the wise men who rule in our Gotham.

Professor Rand, of the Franklin Institute and of the Philadelphia High School, when called upon to give testimony in the case, stated that he had practiced medicine for twelve years and he did not believe that salting streets was prejudicial to public health, or productive of epidemics, as some persons had alleged. He said :—

The greater prevalence of certain epidemics in winter is easily accounted for by deficient ventilation and comparative inattention to cleanliness during the cold season. The cause of colds from wet feet is due partly to conduction through the leather of the heat of the foot, and evaporation kept up from the surface of the foot. It is a common belief among seafaring men that wetting with salt water is less injurious than with fresh water. Its effects upon leather may be retarded, if not averted, by applying grease. The fogs on the sea shore are fresh. Salt will not volatilize at a temperature less than red heat.

The Doctor did not believe there was any increase of mortality among children from catarrhal diseases since the use of salt upon the railroads. He could not be certain, as the statistics of the last two years had not been kept as they now are. Snow without salt may alternately melt and freeze for days together. The smallest quantity of salt will continue to melt the snow until itself is infinitesimally diluted. The difference between salt and no salt is, that with salt you may have one day's slush where the slush would last a week without it.

Sea water will freeze at a temperature a little lower than the freezing point of ordinary water. But the slush from salt would keep on melting much longer. Diphtheria is an inflammation of the throat, very analogous to croup, except that instead of attacking the breathing apparatus it affects the tonsils and swallowing apparatus. True diphtheria is rare and very fatal. It is accompanied with an exudation of lymph matter. A large number of cases of sore throat, quinsy, &c., are called diphtheria, when nothing like it exists. Chlorate of potash is largely used as a remedy.

Professor Rogers, being called upon to give his opinion on the subject said he had experimented upon the respective strengths of snow water with salt and sea water. Salt slush was a brine considerably weaker than sea water. You can boil salt water as easily as fresh. Salt water containing about one or two per cent of salt does not freeze, though the night is cold, but continues to run off. The city is thus drained. Salt and water wets the feet less rapidly than fresh water, and with a saturated solution of salt and water you can scarcely wet a piece of leather at all. The amount of salt in the snow after its conversion into slush is a very homeopathic quantity. The small per centage of salt used, the very moderate reduction of temperature, and the brief continuance of that reduction, as caused by the use of salt taken in connection with the advantage of draining the city in a short time, were reasons why the Professor advocated instead of reprehended the use of salt in the streets.

Julius Esenwein, farrier, pronounced the feet of horses to be uninjured, if not benefited, by the salt slush. The animals take no more colds than before salt was used. The number of sick horses has been less, though why this was so the farrier could not state.

The committee have publicly advertised for people to come forward and show the objections to salt, but no counter data to the above have been given. Meanwhile the verdict stands for the salt. Thus far science has rather sanctioned than condemned it.

THE Cold Spring Foundry at West Point has up to this time, furnished upward of 600 Parrott rifled guns to the government, which is a substantial proof of its value.

Large quantities of cotton have lately arrived at this port from Liverpool. The steamer *John Bell* arrived a few days since with 2,000 bales.

Priming in Steam Boilers—Its Causes and Remedies.

In answer to several inquiries lately made of us on this subject, we quote the following sound information from Bourne on the steam engine.

Priming is a violent agitation of the water within the boiler, in consequence of which a large quantity of water passes off with the steam in the shape of froth or spray. Such a result is injurious, both as regards the efficacy of the engine, and the safety of the engine and boiler; for the large volume of hot water carried by the steam into the condenser impairs the vacuum, and throws a great load upon the air pump, which diminishes the speed and available power of the engine; and the existence of water within the cylinder, unless there be safety valves upon the cylinder to permit its escape, will very probably cause some part of the machinery to break, by suddenly arresting the motion of the piston when it meets the surface of the water—the slide valve being closed to the condenser before the termination of the stroke, in all engines with lap upon the valves, so that the water within the cylinder is prevented from escaping in that direction. At the same time the boiler is emptied of its water too rapidly for the feed pump to be able to maintain the supply, and the flues are in danger of being burnt from a deficiency of water above them. The causes of priming are an insufficient amount of steam room, an inadequate area of water level, an insufficient width between the flues or tubes for the ascent of the steam and the descent of water to supply the vacuity the steam occasions, and the use of dirty water in the boiler. New boilers prime more than old boilers, and steamers entering rivers from the sea are more addicted to priming than if sea or river water had alone been used in the boilers—probably from the boiling point of salt water being higher than that of fresh, whereby the salt water acts like so much molten metal in raising the fresh water into steam. Opening the safety valve suddenly may make a boiler prime, and if the safety valve be situated near the mouth of the steam pipe, the spray or foam thus created may be mingled with the steam passing into the engine, and materially diminish its effective power; but if the safety valve be situated at a distance from the mouth of the steam pipe, the quantity of foam or spray passing into the engine may be diminished by opening the safety valve, and in locomotives, therefore, it is found beneficial to have a safety valve on the barrel of the boiler at a point remote from the steam chest, by partially opening which any priming in that part of the boiler adjacent to the steam chest is checked, and a purer steam than before passes to the engine. When a boiler primes, the engineer generally closes the throttle valve partially, turns off the injection water, and opens the furnace doors, whereby the generation of steam is checked, and a less violent ebullition in the boiler suffices. Where the priming arises from an insufficient amount of steam room, it may be mitigated by putting a higher pressure upon the boiler and working more expansively, or by the interposition of a perforated plate between the boiler and the steam chest, which breaks the ascending water and liberates the steam. In some cases, however, it may be necessary to set a second steam chest on the top of the existing one, and it will be preferable to establish a communication with this new chamber by means of a number of small holes, bored through the iron plate of the boiler, rather than by a single large orifice. Where priming arises from the existence of dirty water in the boiler, the evil may be remedied by the use of collecting vessels, or by blowing off largely from the surface; and where it arises from an insufficient area of water level, or an insufficient width between the flues for the free ascent of the steam and the descent of the superincumbent water, the evil may be abated by the addition of circulating pipes in some part of the boiler which will allow the water to descend freely to the place from whence the steam rises, the width of the water spaces being virtually increased by restricting their function to the transmission of a current of steam and water to the surface. It is desirable, however, to arrange the heating surface in such a way that the feed water entering the boiler at its lowest point is heated gradually as it ascends, until towards the superior part of the flues it is raised gradually into steam; and in boilers designed upon this principle, there will be less need for any special provision to enable currents to rise or descend. The steam pipe proceeding to the engine should obviously be attached to the highest point of the steam chest, in boilers of every construction.

The Queen Bee.

In connection with the improved beehive, illustrated in our last number, we publish the following curious facts, which have long since been ascertained, but which we extract in this form from the admirable article on the bee in "Appleton's New American Cyclopedia":—

The queen bee is the largest, being 8½ lines in length, the males being 7, and the workers 6; her abdomen is longer in proportion, and has 2 ovaria of considerable size; her wings are so short as hardly to reach beyond the third ring, and her color is of a deeper yellow. She is easily recognized by the slowness of her march, by her size, and by the respect and attentions paid to her; she lives in the interior of the hive, and seldom departs from it unless for the purpose of being impregnated or to lead out a new swarm; if she be removed from the hive the whole swarm will follow her. The queen governs the whole colony, and is in fact its mother, she being the only breeder out of 20,000 or 30,000 bees; on this account she is loved, respected and obeyed with all the external marks of affection and devotion which human subjects could give to a beloved monarch.

The eggs and larva of the royal family do not differ in appearance from those of the workers; but the young are more carefully nursed, and fed to repletion with a more stimulating kind of food, which causes them to grow so rapidly that in 5 days the larva is prepared to spin its web, and on the 16th day becomes a perfect queen. But, as only one queen can reign in the hive, the young ones are kept close prisoners, and carefully guarded against the attacks of the queen mother, as long as there is any prospect of her leading another swarm from the hive; if a new swarm is not to be sent off, the workers allow the approach of the old queen to the royal cells, and she immediately commences the destruction of the royal brood by stinging them, one after the other, while they remain in the cells. Huber obseves that the cocoons of the royal larvæ are open behind and he believes this to be a provision of nature to enable the queen to destroy the young, which, in the ordinary cocoon, would be safe against her sting. When the old queen departs with a swarm, a young one is liberated, who immediately seeks the destruction of her sisters, but is prevented by the guards; if she departs with another swarm, a second queen is liberated, and so on, until further swarming is impossible from the diminution of the numbers or the coldness of the weather; then the reigning queen is allowed to kill all her sisters. If two queens should happen to come out at the same time, they instantly commence a mortal combat, and the survivor is recognized as the sovereign; the other bees favor the battle, form a ring, and excite the combatants, exactly as in a human prize fight.

Experiments amply prove that on the loss of the queen the hive is thrown into the greatest confusion; the inquietude which commences in one part is speedily communicated to the whole; the bees rush from the hive, and seek the queen in all directions; after some hours all becomes quiet again, and the labors are resumed. If there be no eggs nor brood in the combs the bees seem to lose their faculties; they cease to labor and to collect food, and the whole community soon dies. But if there be brood in the combs the labors continue as follows:—having selected a grub, not more than 3 days old, the workers sacrifice 3 contiguous cells that the cell of the grub may be made into a royal cell; they supply it with the peculiar stimulating jelly reserved for the queens, and at the end of the usual 16 days the larva of a worker is metamorphosed into a queen. This fact, which rests on indisputable authority, is certainly a most remarkable natural provision for the preservation of the lives of the colony. While a hive remains without a queen swarming can never take place, however crowded it may be. The possibility of changing the worker into a queen is taken advantage of in the formation of artificial swarms, by which the amount of honey may be indefinitely increased. In a well-proportioned hive, containing 20,000 bees, there would be 19,499 workers, 500 males and 1 queen.

THE Ericsson steam battery has been successfully launched.

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RECENT AMERICAN INVENTIONS.

Firearms.—This invention consists in forming upon the muzzle of a musket, rifle or other gun barrel, or providing the same with a cutter or notched, toothed or otherwise roughened edge, for the purpose of cutting or breaking the cartridges, and so obviating the necessity of biting them. Invented by C. H. Bradley, of Westchester, Pa.

Evaporator.—This invention consists in the arrangement of two pans, one on the top of the other, in combination with a flue running alongside of the bottom of the upper pan, and consequently on the top of the lower pan, in such a manner that the heat passing through said flue serves to heat simultaneously the contents of the upper and those of the lower pan; also in the arrangement of two strainers in combination with three pans placed at different levels and divided into a number of compartments in such a manner that the juice in passing from one pan to the next succeeding one is strained and freed from curdles, bits of cane and other impurities that may be mixed up with it, while at the same time said juice is gradually boiled down so that the same passes off from the last compartment of the last pan perfectly clear and finished. Patented to O. N. Brainerd, of Marion, Iowa.

Let Off for Power Looms.—This invention, by T. H. and H. James, of Stockport, N. Y., consists in a certain novel and very simple mode of combining the whip roll with the weighted levers employed to produce friction upon the yarn beam, whereby the letting off of the yarn is controlled perfectly by the tension of the warp, and the said tension kept uniform, whatever may be the quantity of yarn on the beam.

Slide Valve.—This invention relates to the connection of the slide valve with a piston which is fitted to an open cylinder in the back of the valve chest, and upon which the pressure of the steam acts in opposition to its pressure on the back of the valve; and it consists in combining the valve with the piston by means of a roller attached to the valve, and a straight bar attached by a yoke to the piston. Invented by Jacob Martin, of Mound City, Ill.

Grading and Excavating Machine.—This invention relates to certain improvements in that class of grading and excavating machines in which a cutter or share is used in combination with an endless conveying apron for conveying the earth to a wagon or cart accompanying the machine, or for depositing the earth in ridges by the side of the excavation. The object of the invention is to render the cutter or share adjustable in such a manner that it may always be made to work in a perfectly horizontal position in a transverse direction, however much inclined the surface of the ground may be over which the machine is passing. The invention has also for its object the constructing of the endless conveying apron in such a manner that the earth will be readily discharged from it, and also so arranging the cutter or share beam that the cutter may be made to penetrate the earth at a greater or less distance, as may be required, and the cutter or share beam rendered capable of being adjusted horizontally in a longitudinal direction. Invented and patented by Albert Keith, of Lisbon, Ill.

Pulverizer and Amalgamator.—The object of this invention is to obtain a machine which will complete the process of pulverizing the ore, as it comes from the stamping mills, and during the process of amalgamating the same, so that a more perfect separation may be obtained of the metal from the ore than by the ordinary amalgamating machines. The invention is chiefly designed for separating gold from quartz, and to receive the pulp as it is discharged from the ordinary stamp batteries or stamping mills. The invention consists in the employment or use of a rotary or reciprocating pulverizer and amalgamator formed of a cylinder or semi-cylinder provided with grooves which contain balls or spherical crushers, and using in connection therewith a rotary hollow cylinder or drum, having an amalgamated inner surface, and so arranged as to receive the contents of the pulverizer and amalgamator and separate any particles of gold that might have escaped in passing through the pulverizer and amalgamator. The above invention is by James Burrell, of Central City, Colorado Territory.

Breech-Loading Gun.—This invention consists in the combination of a ring or open cap screwing on to a thread provided for it on the exterior of the rear portion of the body or barrel of gun, and a slide working in a mortise provided for it in the said ring or cap. The credit of this invention is due to T. C. Rice, of Cambridgeport, Mass., who may be addressed in care of H. N. Hooper & Co., of Boston, for further information.

Brush.—J. A. Fanshawe and J. A. Jaques, of Tottenham, England, obtained a patent, dated January 7, 1862, for an improved brush, the claim of which appeared in No. 4 of the current volume. This brush is specially adapted for washing the hands, for use in the bath and for other lavatory purposes. Its rubbing surface is made of soft india rubber in the form of a series of concentric annular edges or a continuous convolute edge. The back may be of the same material when flexibility is desired, or of hard india rubber when rigidity is desired.

NOTES ON FOREIGN INVENTIONS AND DISCOVERIES.

Chain Harrows.—A patent has been taken out by W. Baylise, of Wolverhampton, England, for an improvement in chain harrows, consisting in keeping the links fully extended by suitable strips of thin steel, which form springs like those used for hoop skirts. With the use and combination of such steel springs in a chain harrow it can be drawn obliquely across plowed fields, and it accommodates itself to all unevenness and inequality of the soil's surface.

Bleaching Rags for Paper.—When colored rags are employed for making paper they are washed and reduced to pulp, then bleached with chlorine liquor. T. Gray, of Wandsworth, England, states, in a patent which he has received, that when colored rags are subjected to the action of dilute muriatic acid for several hours in a vat, before being placed in the bleaching liquor, in the usual way, that a superior bleaching effect will be insured.

Gutta-Percha Cements.—D. McKay, of Oxford, England, makes a gutta-percha cement for uniting articles of leather, wood, paper, &c., by dissolving the gutta percha, cut in small pieces, in the bisulphide of carbon, exposed to the atmosphere. It has been customary to dissolve gutta percha and such resin gums in the preparation, kept in a close vessel, but by exposing it to the atmosphere during the period of action it absorbs some oxygen, and becomes more adhesive.

Preserving Railroad Timbers.—J. Cullen, of the North London Railway, has patented a composition for treating railway timber to preserve it. The composition consists of charcoal in fine powder, coal tar and quick lime sifted. The tar is heated in an iron vessel, then the charcoal and lime are added in equal quantities, making about ten per cent of the whole mixture. When it has boiled for one hour the timber may be immersed in it for a few minutes, then taken out and laid aside to cool. This composition may also be applied hot, with a suitable brush, as a paint for coarse boards, and for iron work laid in the ground or otherwise exposed, as it prevents it from rusting.

Improved Electrical Pile.—J. A. Calland, of Nantes, France, has obtained a patent for an electrical pile, in which he dispenses with the porous cell used in the Daniel and other batteries. His battery is thus described:—If a vessel of glass or stoneware be about half filled with a cold saturated solution of sulphate of copper, and pure water or weak salt brine, be then poured cautiously in on the top, the latter will remain separate from the former, and from that moment there will be a disengagement of electricity from the contact of these two liquids. A positive electrode connected with a wire is placed in the liquid at the bottom of the vessel, and a negative electrode in the top solution, and a galvanic pile is thus formed. The wire of the plate which is placed in the lowest solution must be coated with some non-conducting substance.

BUTTER IN WINTER.—You cannot get butter out of milk if there is none in it. Feed the cows well and thus secure good milk, and there is not much trouble in churning even in winter. Keep the cream in a warm room till it turns somewhat sour. Let the churn be scalded before pouring in the cream, so that it will be well heated through and not cool the cream. Let the cream be at a temperature of 65° to 76°, and there will not be much difficulty in making the butter come.

ISSUED FROM THE UNITED STATES PATENT OFFIC

FOR THE WEEK ENDING JANUARY 28, 1862.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

34,233.—T. K. Anderson, of Hornellsville, N. Y., for Improved Composition of Fuse or Slow Match for Igniting Powder Under Water:

I claim a compound consisting of the four-named ingredients, in or about the same proportions specified; prepared and used in the manner as and for the purposes set forth.

34,234.—Frederick Andriessen, of Alleghany City, Pa., for Improved Car Truck Regulator:

I claim the application of this self-adjusting regulator with the four leading poles, friction rollers, &c., (see letters A, B B, C C C C, D D D D D D and E E E E of the drawings) to R R, locomotives and cars.

34,235.—C. H. Bradley, of Westchester, Pa., for Improvement in the Muzzle of Firearms for Cutting off Cartridges:

I claim providing a portion or the whole of the end, or muzzle, of a gun barrel with teeth, or otherwise rendering the same rough, as and for the purpose set forth and described.

34,236.—O. N. Brainerd, of Marion, Iowa, for Improved Evaporating Pans for Saccharine Liquids:

I claim, first, The arrangement of the pans, A and B, in combination with the flue, D, at the bottom of the former and at the top of latter, constructed and operating in the manner and for the purpose shown and described.

Second, The arrangement of the strainers, G H, in combination with the pans, A B C, constructed and operating as and for the purpose specified.

34,237.—J. S. Brooks, of Rochester, N. Y., for Improvement in Sad-Iron Heaters:

I claim an improved sad-iron heater, consisting of the pan, A, divided into separate compartments for each iron, with hinged falling lids, or covers, c d, so arranged that the removal of an iron from one chamber, will cause the lid or lids to fall over the adjoining one, substantially in the manner and for the purposes described.

34,238.—James Burrell, of Central City, Colorado Territory, for Improved Amalgamator and Ore Crusher:

I claim, first, A rotating or reciprocating pulverizer and amalgamator, B, when constructed with a series of circumferential grooves, a, each of which is a provided with a ball, D, arranged as described.

Second, In connection with the pulverizer and amalgamator, B, constructed as described, the cylinder, H, provided with an amalgamated inner surface, and arranged to operate conjointly with B, substantially as and for the purpose set forth.

34,239.—J. M. Clark, of Lancaster, Pa., for Improvement in Apparatus for Feeding Mills:

I claim, first, The employment of the revolving cup, F, when adjustable, substantially as and for the purpose specified.

Second, The arrangement of the cup, F, the strap, a, and rim, E, secured and connected by means of clips, c c, substantially as represented.

Third, The employment of the stationary shield, G, used and for the purpose specified.

34,240.—J. W. Clark, of Springfield, Mass., for Improvement in Tools for Making Screws:

I claim the arrangement of the cutters, B C F, opening, e, segmental rim, d, and movable guide plate, G, in combination with the stock, A, as and for the purpose described.

The object of this invention is to construct a simple and effective tool for making screws from iron, brass or any other wire, and the invention consists in the arrangement of three cutters fitted into a common stock, which is provided with two guide openings or rests, one to fit the head and the other the shank of the screw, in such a manner that by the action of the first tool the wire is turned down to the size of the head, by the second to the size of the shank and by the third the point is rounded and the screw completed to receive the thread.]

34,241.—C. A. Codding, of Augusta, Mich., for Improvement in Cheese Presses:

I claim the employment of the adjustable bottom, C, constructed as set forth, in combination with the hoop or cylinder, A, and perforated plunger, B, arranged and operating as and for the purpose specified.

34,242.—J. M. Connel, of Newark, and J. S. Hall, of Columbus, Ohio, for Improvement in Shells for Rifled Ordnance:

We claim, first, The explosive projectile made of two hollow parts, A A′ B B′, which are fitted together so that a space, C, exists between their facing ends, a b, and the part, A A′, having circumferentially segmental cavities, D, and the part, B B′, having angular cavities, E, beveled projections, F, and a beveled, continuous circumferential edge, G, and the whole being encircled and held together by a lead packing ring, H, in the manner and for the purposes described.

Second, Constructing the interior of one portion of the projectile with a front and rear rest or shoulder, c d, and arranging in or against the same an open-ended hollow tube, K, for the purpose of separating the contents of the chamber, J, from the igniting magazine, K1, substantially as and for the purposes set forth.

Third, In combination with the shoulders, c d, and tube, K, we claim providing a central opening, f, in the end, a, of the part, A A′, and a similar hole, g, in the end, b, of part, B B′, and arranging and igniting magazine, K′ K2, within the hollow tube, K, and in the openings, f g, in the manner and for the purpose described.

Fourth, The combination of a sliding, igniting magazine with the hollow explosive projectile, substantially as and for the purposes described.

34,243.—Ransom Cook, of Saratoga Springs, N. Y., for Improved Lunch Box:

I claim a lunch case, composed of the dishes, E E E, the vessels, F F, the driving cups, G G, the inner cover, C, its rib, D, with the case, A, and the cover, B, the whole constructed and arranged as set forth for the purpose specified.

34,244.—Simeon Coon, of Ithaca, N. Y., for Improvement in Window Sash and Setting Glass therein:

I claim my peculiar construction of window sash with loose munnions adjusted as described, and slots cut through the frame, for the purpose of admitting glass; all in combination with the method of securing the glass, as set forth in my specification.

34,245.—J. H. Duffield, of Glassboro', N. J., for Improvement in Cases for Railroad Tickets:

I claim the application to a ticket case, constructed in any suitable form, of the sliding spring stem, C, constructed and arranged to operate in combination therewith and the tickets contained, in the manner described and set forth, for the purpose specified.

34,246.—O. L. Edwards and Nelson Gabel, of Gratis, Ohio, for Improvement in Fences:

We claim, in the construction of portable fences, the combination and arranging of keys, b′ b″, d d, post, C and E, and rails, A, substantially as set forth

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34,247.—John Ellis, of Detroit, Michigan, for Improvement in Carriage Gates :

I claim the extension, H, cap, K, latch, I, and connecting link, a, in combination with the ropes, M M′ when these several parts are constructed, arranged and operated as and for the purposes set forth.

34,248.—G. F. Evans, of Norway, Maine, for Improvement in Plane Stocks :

I claim my improved plane, having its body, A, its bearing plate, E, its screws, G G′, traversing nuts, H H′, and connecting rods, I I, constructed and arranged in relation to each other, and so as to operate together as set forth.

34,249.—S. W. Francis, of New York City, for Improved Pocket Match Box :

I claim the combination and arrangement of the box, A B, the drawer, C, the springs, F and I, and stopper, M, substantially as and for the purpose specified.

34,250.—T. J. Griffin, of Brooklyn, N. Y., for Improved Combined Camp Cot and Chest :

I claim the described combination of camp cot and chest, consisting of the three sections of mattress frame, D D′ E, hinged together so as to have the two former fold up compactly upon the latter, when not in use as a couch, the latter forming a tight cover for the chest, A, and as support or bedstead for the couch, the whole arranged to operate in the manner and for the purpose set forth.

[The object of this invention is to obtain a cot and chest combined in such a manner in one article as that the same can either be used as a cot or as a chest to contain the mattress and bed clothes, and also books and other articles required by officers and privates in camp.

34,251.—Hiram Grant, of Chicago, Illinois, for Improved Roofing Composition for Railroad Cars, &c.:

I claim the above-named composition matter or ingredients when prepared in the proportions and in the manner specified, and applied as stated.

34,252.—Florian Grosjean, of New York City, for an Improvement in Sheet Metal Spoons :

I claim corrugating the handle of spoons or forks made of single pieces of sheet metal with the central corrugation and outer bead combined substantially as and for the purpose specified.

34,253.—P. W. Hardwick, of Williamsburgh, Ind., for Improved Apparatus for Attaching and Detaching Horses to and from Carriages :

I claim the clamps as constructed, in connection with the plates or their equivalents, in combination with the spring, the whole being constructed, arranged and operated substantially as above set forth.

34,254.—J. J. Hayden, of Indianapolis, Ind., for Improvement in Metallic Roofing :

I claim, first, The combination in diamond sheet metal roofing, of the peculiar character described, of the upward and downward bent or curved points, S S′, substantially in the manner and for the purposes described.

Second, The combination of the diamond sheets, eave, side and comb, or saddle triangular pieces, and cleats, with the roof of a house, the said parts being constructed and applied in the manner and for the purposes described.

34,255.—T. H. and Henry James, of Stockport, N. Y., for Improvement in Power Looms :

I claim the arrangement of the elbow levers, I I, rods, H H, and the weighted levers, E, with the whip roll, G, straps, D D, and yarn beam, C, in the manner shown and described.

34,256.—Albert Keith, of Lisbon, Ill., for Improvement in Grading and Excavating Machines :

I claim, first, Constructing the endless apron, E, of a series of metal plates, H′, attached to rods, f, the ends of which are connected to chains, g g, and all arranged as shown, to admit of a certain degree of tilting of the plates, H′, as they pass around the pulley, F′, as and for the purposes set forth.

Second, Attaching the beam, A, to the oblique bars, O R, by means of joints or hinges, l′ Q, in connection with adjustable slide, M′, fitted on the perforated bar, L′, provided with a catch or lever, N′, and attached to the upright notched bar. I, all being arranged as shown, to admit of the adjustment of the beam, A, and cutter or share, B, in a transverse direction, as set forth.

Third, Supporting the front part of the beam, A, by means of a caster wheel, C, connected with an adjustable lever, E′, in combination with the wheel, J, which supports the back part of the beam, A, and is connected with the adjustable lever, K, all arranged as and for the waste of purpose specified.

34,257.—E. M. Luckett, of Philadelphia, Pa., for Improved Mode of Cleaning Snow from Railroad Tracks :

I claim the addition of a chamber over the dome of the steam boiler of a locomotive engine, and the introduction of a pipe to convey the waste steam to the rail, (as set forth in the drawing), which, with the aid of an improved snow shovel, will cleanse the rail from snow, frost and dirt, thus improving the speed of the engine, and turning the steam to a profitable account.

34,258.—Edward Lynch, of Buffalo, N. Y., for Improvement in Attaching Beds to Tents :

I claim, first, The arrangement of the beds, E E, the bars, D, strap, J, and the cords, H I, as and for the purpose specified.

Second, The employments of the slides, d d, with loops or staples attached, used in connection with the bars, D D, in the manner and for the purpose specified.

34,259.—Jacob Martin, of Mound City, Ill., for Improvement in Relieving Slide Valves of Pressure :

I claim combining the slide valve with the piston, D, by means of a roller, G, attached to the valve, and a bar, H, attached to the said piston, substantially as and for the purpose specified.

34,260.—Thomas Miles, of Philadelphia, Pa., for Improvement in Slinging Knapsacks :

I claim sustaining a knapsack upon the back and shoulders of the wearer, by means of a single strap and a single fastening, substantially as described.

34,261.—J. T. Minard, of Danbury, N. H., for an Improvement in Seats for Wagons and Sleighs :

I claim the peculiar construction of the adjustable seat, B, in combination with the movable seat, A, to a wagon or sleigh body, so as to form a single or double-seated wagon or sleigh, arranged as and for the purpose specified.

34,262.—William Morrisson, of Chadd's Ford, Pa., for Improvement in Combined Iron and Steel Plows :

I claim a mould board s for a plow composed of a steel face, and an iron back, made and united to the plow substantially as described.

I also claim, in combination with a permanent land side and a bar share, as described, a steel cutter that is united to the outside of such land side, and by a groove to the bar share, in such manner as to be adjusted thereon, as it wears away, as set forth and described.

34,263.—J. B. Prescott, of Waterford, N. Y., for Improvement in Breech-Loading Cannon :

I claim the arrangement of the adjustable bands and bars with the breech piece and shoulders, C, in the manner shown and described.

34,264.—T. J. Price, of Industry, Ill., for Improvement in Construction of Evaporating Pans for Saccharine and Other Juices :

I claim, first, An evaporator for saccharine or other juices having partitions, J, extending from side to side with openings at alternate ends, and secured by bolts or rivets between upturned flanges, a, of the bottom plates, all as before explained.

Second, The combination of the vertical flanges, a, horizontal lapping edges, a′, and painted canvas luting, n, all arranged and employed in the manner and for the purpose explained.

Third, The combined arrangement of the furnace, A, contracted throat, c, and guards, R, applied to the rear divisions of the pan, all as shown and described, and for the purpose specified.

34,265.—D. B. Ray, of Circleville, Ohio, for Improved Type-Setting Machine :

I claim constructing tubes, C C, or their equivalents with two branches or arms, M and M′, and a regulator, g, and its mechanism, substantially in the manner and for the purpose set forth.

Second, I claim the spirally curved or twisted tube, M, in combination with the main tube, C, substantially in the manner and for the purpose set forth.

Third, I claim arranging the tubes or their equivalents, like the radia of a circle.

Fourth, I claim the catch, t, for feeding out the type.

Fifth, I claim the spring, f, slide, x, and rockshaft, v, combined with the composing stick, S, substantially in the manner and for the purpose set forth.

34,266.—T. C. Rice, of Cambridgeport, Mass., for Improvement in Breech-Loading Ordnance :

I claim the combination of the slide, B, with the screw cap, C, and barrel, A, substantially in the manner shown and described.

34,267.—M. B. Riggs, of New York City, for Improvement in Guard Fingers for Harvesters :

I claim the bar, E, made either entire or in sections, and provided with the lugs, F, as described, when arranged in combination with the fingers and counter cutters in the manner and for the purpose specified.

34,268.—J. P. Rollins, of Cedar Rapids, Iowa, for Improvement in Shells for Rifled Ordnance :

I claim the combination of a sliding spring rod, F, projecting in front of the shell with a discharging apple, e, formed upon a screw, D, inserted from the rear, all substantially as and for the purpose set forth.

[This invention relates to an improved device for effecting the explosion of a hollow projectile or shell by percussion.]

34,269.—W. J. Sage, of Steubenville, Ohio, for Improvement in Mode of Propelling Cars :

I claim the two drums or cylinders, D F, provided with the toothed rims, E G, with the pinions, C, of the axles, A, placed between them, as and for the purpose set forth.

[The object of this invention is to apply the propelling power to railroad cars in such a manner as to avoid the friction now produced by the weight of the cars on the axles of the wheels. To this end gears or pinions are attached to the axles of the wheels, which gears or pinions are fitted between toothed rims or drums, to which the power is applied.]

34,270.—William Romans, of Columbus, Ohio, for Improvement in Locomotive Cars :

I claim, first, The manner, substantially as described, of adapting a locomotive and a car for direct connection with one another in such manner that all the connections of the locomotive are free to turn, independently of the car, and that the right of the front end of the car rests centrally, or nearly centrally, on the locomotive truck, and thus is made available for steadying the locomotive on the truck while the center of motion of the locomotive is transferred from the rear end to the center of the truck, all as and for the purpose set forth.

Second, Making the front bolster, G, and also the fender, F, removable, substantially as and for the purpose set forth.

Third, In combination with the construction and use of the devices, as set forth in the first claim, in the manner substantially as described, of arranging the valve rods, link motions and eccentrics, between the inner faces of the locomotive driving wheels and the outer sides of the locomotive truck frame, for the purpose set forth.

Fourth, So constructing and arranging the car and the rear truck, and connecting the same that the truck, while the car is resting upon it may be moved a greater or less distance toward the locomotive, and when thus moved shall be free to turn curves, substantially as and for the purpose set forth.

Fifth, The combination of the flanged plate, V′, of the rear truck, and the tubular projections, h, of the rear bolster, J, of the car, substantially as and for the purpose described.

34,271.—J. F. Scholfield, of Lawrence, Mass., for Improvement in Shuttles :

I claim the application of this device, made from either metal, or any other suitable material, to a weaver's shuttle for preventing kinks in the weft, while passing from the shuttle to the cloth, substantially as set forth.

34,272.—Joseph Short, of Boston, Mass., for Improvement in Knapsacks :

I claim, first, Arranging, disposing and attaching straps to and upon a knapsack, so that its top may be allowed to fall away from contact with the shoulders and spine of the wearer, for the purpose of ventilating the back and shoulder of the wearer, and at the same time cause a different set of muscles to be brought into action, in the manner substantially as described.

Second, I claim arranging and adapting straps to support and confine a knapsack to the shoulders and back of the wearer, so that it can be raised and lowered in a vertical line, or nearly in a vertical line, upon the back and shoulders of the wearer, and be held in the desired fixed position, on such line, at the will of the operator, in the manner substantially as described.

Third, I claim a combined neck and shoulder strap, having connections with a knapsack by intermediate straps, at points which are at or near the top and base of the knapsack, for the purpose specified.

Fourth, I claim the combination of the removable curved side walls, with the adjusting straps, whereby the body of the knapsack is adapted to the back and shoulders of the wearer in its different positions, as and for the purpose described.

34,273.—A. H. Silvester, of Boston, Mass., for Improvement in the Manufacture of Bootees :

I claim the bootee, constructed as described, with the adjustable fastenings, and whereby all the advantages are combined, as an improved new article of manufacture, for the purposes specified.

34,274.—L. E. Smith, of New Haven, Conn., for Improvement in Railroad Station Indicators :

I claim the combination of the box, rollers, curtain and springs, substantially as described and for the purpose set forth.

34,275.—Matthew Smith, of Pittsburgh, Pa., for Improvement in Steam Boilers :

I claim combining with the interior of a cylindrical boiler, a steam receiver or receivers, wholly or partially immersed in the water, and permanently held in such proximity to the bottom of the boiler as to produce a thin sheet of water between the receiver and the boiler, for the purpose as set forth.

Second, I also claim the combination of a steam receiver, by means of trunnions, with the interior of a cylindrical boiler, in the manner and for the purpose, as set forth.

Third, I also claim the combination of a blow-off valve or cock, with a steam receiver, in a cylindrical boiler, passing through the boiler and communicating only with the interior of the receiver, for the purpose as stated.

34,276.—D. W. Swift, of West Falmouth, Mass., for Improved Clothes-Wringing Machine :

I claim the springs, E E, constructed of steel of the form shown, when said springs are applied to the cylinder, A, of the frame of the device to form a support for the lower roller, G, and at the same time admit of the upper roller, G, being applied to them so that the springs will press said roller, G, on the roller, F, as set forth.

I further claim the guide pins, I I, when attached to the bar, H, fitted on the springs, E E, and placed in relation with the rollers, F G, as and for the purpose specified.

[This invention relates to an improved clothes-wringing device, of that class in which pressure bollers are employed, and which are secured to the edge or side of the washtub or vessel by means of a clamp.]

34,277.—Andrew Turnbull, of West Meriden, Conn., for Improvement in Lamps :

I claim combining with the tube, f, a spindle crank, i, snuffer or extinguisher, j, substantially as and for the purpose described.

34,278.—J. S. Whitehill, of Westchester, Pa., for Improvement in Running Gear of Wagons :

I claim the adjustable coupling pole, A, held by the king bolt, D, passing through the rear end of hounds, and circular plate, E, all in combination as described, and for the purposes set forth.

34,279.—William Wicken, of Muscoda, Wis., for Improvement in Grain Separators :

I claim operating the screens, D′ G, and giving them a reciprocating sliding movement through the medium of the bell crank, F, fitted in the shoe, C, and connected to the screens, D′ G, by means of the hook, E, and rod, k, and also to a stationary rod, j, the screens being operated by the movement of the shoe, C, all arranged in the manner described.

[This invention relates to a new and useful improvement in grain separators, whereby cockle and chess may be sifted and screened from the grain in a thorough manner.]

34,280.—G. K. Dearborn, of Abington, Mass., assignor to S. T. Tapley, of Chelsea, Mass., for Improvement in Heaters for Passenger Cars :

I claim the furnace for railway and street cars, constructed substantially as described, with the flues, K, and auxiliary flues, said furnace being arranged under the floor of the car, and operating substantially as set forth.

34,281.—Josee Johnson, of New York City, assignor to himself and John Ward, Jr., of Brooklyn, N. Y., for Improved Clothes Wringer :

I claim, first, The described metallic frame for a wringing machine, constructed in two parts, A B, the dividing line passing through the axis of the rollers, C D, and the sides being so formed as to partially inclose the said rollers, and serve as guides for the clothes, substantially as and for the purposes described.

Second, I also claim the recess, G, in each end of each of the parts, A and B, so made that when the parts, A and B, are placed together they formed an inclosed space for the springs, H, substantially as set forth.

34,282.—J. A. Hamer, of West Vincent. Pa., assignor to W. L. Paxson, of Philadelphia, Pa., for Improvement in Brick Moulds :

First, I claim the combination of the side pieces, A A, with their angular grooves, with the cross pieces, C D, double crank shafts, E E, and lifting pieces, f f f, constructed and operated in relation to each other, substantially as described.

Second, The combination of the vibrating valves, h, with the sides, A A, and cross pieces, substantially as and for the purposes set forth.

34,283.—Wm. Peters (assignor to himself and R. B. Porter), of Baltimore, Md., for Improvement in Packing for Steam and other Engines :

I claim the packing described for steam and other joints, composed of asbestos and vegetable or animal fiber or material.

34,284.—H. T. Romertze, of Philadelphia, Pa., for Improvement in Automatic Car Coupling :

I claim the jaws, b b, the sockets, c c, the slots, i i, in combination with the releasing lever, d, spring, g, case or box, a, with the projections, h h, substantially as shown and described.

34,285.—D. M. Mefford, of Cincinnati, Ohio, for Improvement in Projectiles for Firearms :

I claim a projectile having a metallic head of smaller diameter than the bore of the piece with which it is intended to be used, and a shaft of wood or other light material, the greatest diameter of which fits the bore, or nearly so, when the parts are so formed and combined that the greatest diameter of the shot is in the rear of the center of the figure, and the center of the figure is in the rear of the center of gravity, substantially as shown and explained.

[This projectile consists of a wooden shaft of peculiar form, and a metallic head of smaller diameter. It obviates the necessity of rifling the gun, and been found, in recent experiments conducted by the ordnance board, to afford greater range and precision with a common smooth bore musket than are attainable with the Minié ball with rifles of the most approved construction.]

RE-ISSUES.

1,261.—St. John O'Doris, of Philadelphia, Pa., for Improvement in Fertilizers. Patented Dec. 24, 1861.

I claim the use of coal ashes as a basis for deodorizing, absorbing and retaining of animal vegetable and mineral matter, in solution or otherwise, when united in a fertilizing compound, substantially as set forth

1,262.—Byron Densmore, of Sweden, N. Y., assignor to D. M. Osborne, of Auburn, N. Y., and A. W. Kirby, of Buffalo, N. Y., for Improvement in Harvesters. Patented Feb. 10, 1852 :

I claim, first, Hanging the driving in a supplementary frame, or its equivalent, which is hinged at one end by the main frame, while its opposite end may be adjusted and secured at various hights, or be left free as desired, whereby the cutting apparatus may be held at any desired hight for reaping, or be left free to accommodate itself to the undulations of the ground, substantially as described.

Second, The employment in a harvesting machine of a wheel, provided with a crank and lever, for the purpose of raising and lowering the outer end of the finger bar, to cut high or low, substantially as described.

1,263.—F. E. Sickles, of New York City, for Improvement in the Method of Opening and Closing the Valves of Steam Engines. Patented Oct. 19, 1844. Re-issued Jan. 1, 1861, No. 8.

I claim giving to each exhaust valve alternately, while the piston is at or near the end of the cylinder farthest from it, a large amount of motion as compared with the motion of the other exhaust valve at that time, so as to more freely exhaust the cylinder with less extent and greater ease of motion to the valves than has been done heretofore, substantially as described.

I also claim imparting these motions to the exhaust valve by means of a rocker interposed between the first motion from the engine and the valves, so that it will increase and diminish its leverage relative to each valve, while moving them, and thereby impart my improved motion.

1,264.—W. W. Wade, of Longmeadow, Mass., for Improvement in Sewing Machines. Patented Feb. 1, 1859.

I claim a driving shaft of a sewing machine, having cranks set at right angles to each other, or so approximating thereto as to overcome or avoid a dead center in the movement of the shaft, substantially as and for the purpose set forth, in combination with the treadles, H H, the driving pulley, N, and a device for preventing a retrograde motion of the shaft.

Second, I claim, in combination with a sewing-machine driving shaft, a ratchet device for preventing a retrograde motion when such device is caused to cease its action upon the shaft by means of friction induced between its parts by the forward revolution of the shaft, and is caused to come into action when a back thrust comes upon the shaft, constructed substantially as and for the purpose set forth.

1,265.—Henry Megeon, of Wolcottville, Conn., assignee of J. L. Baudelot, of Havencourt, France, for Improvement in Process of Cooling Beer and other Liquids. Patented Nov. 1, 1859. Ante-dated April 13, 1856.

I claim the process of cooling beer, by causing it to trickle in a thin film along one surface of metal, as specified, while such surface is kept cool by the passage in the reverse direction of water or other cooling liquid, in contact with the other surface thereof, substantially as and for the purposes specified.

1,266.—Henry Migeon, of Wolcottville, Conn., assignee of J. L. Baudelot, of Havencourt, France, for Improvement in Apparatus for Cooling Beer and other Liquids. Patented Nov. 1, 1859. Ante-dated April 13, 1856.

I claim directing the trickling liquid to be cooled from the bottom of one pipe to the next below it, by means of a downward projection, substantially as described, whereby the distribution of the liquid to be cooled is more uniformly maintained, and the contact thereof with the whole cooling surface secured, as set forth.

Also a trough with perforations for supplying the liquid to be cooled, when combined with a screw or perforated receptacle within said trough, for detaining any foreign substance, or for equalizing the distribution in said trough of the liquid to be cooled, as specified.

1,267.—Henry Migeon, of Wolcottville, Conn., assignee of J. L. Baudelot, of Havencourt, France, for Improved Apparatus for Cooling Beer and other Liquids. Patented Nov. 1, 1851. Ante-dated April 13, 1856.

I claim a cooling apparatus for liquids, composed of a vertical range of pipes, passing one liquid successively from the lower to the upper pipes in said range, in combination with the perforated trough, d, or its equivalent, supplying the other liquid, which trickles over the surface of said range of pipes, as set forth.

New Publications.

NEW STORIES.—Published by F. A. Brady, No. 24 Ann street, New York.

"Tom Tiddler's Ground, a Christmas and New Year's Story," Charles Dickens; "The Broken Engagement, or Speaking the Truth for a Day," by Mrs. Southworth, have been sent to us by the above-named publisher.

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PATENTS FOR SEVENTEEN YEARS.

The new Patent Laws enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

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During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

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The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

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Every applicant for a Patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co No. 37 Park-row, New York.

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Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

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The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

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PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1836, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

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NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application at this office. Address MUNN & CO.,
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Notes and Queries

J. L. E., of Pa.—Warren's elements of geometrical drawing, noticed in our last, is very suitable for you to commence with. After going through it you should use a more elaborate treatise on mechanical drafting.

P. M. M., of Mich.—We do not recollect any such apparatus as you mention for registering the pressure of steam, but such an apparatus has been used for registering the pressure of the atmosphere and what would register the one would register the other. The patent law makes no distinction between one elastic fluid and another in such a case, and therefore the most you could claim in a patent would be your particular apparatus.

T. C. R., of Wis.—Projectiles for cannon and also for small arms have been made with finely-grooved surfaces for the purpose of obtaining a rotary motion in their discharge from smooth bores.

G. P., of N. Y.—Your skate improvement appears to be new and patentable. You can easily determine its practical value by a trial.

J. R., of Wis.—The *Architect's and Mechanic's Journal* is extinct.

J. G., of Conn.—By increasing the temperature of your electro-gilding bath you will obtain a deposit of a deeper shade. By moving the articles to be gilded back and forth in the bath, you can also change their color from a brass yellow to a red shade.

J. S., of Ind.—Your plan for propelling ships by means of balloons is one of bold novelty, but we think wholly impracticable. You propose to have the balloon attached to the ship by a line long enough to allow the balloon to rise till it should find a current blowing in the right direction. The constant current from the West is usually found at the hight of about a mile and a half. This would require a hawser too long for practical use.

C. E. F., of Mass.—We are not acquainted with any method of removing the gilt bands from china cups and saucers without injuring them for use and display.

C. S., of Conn.—It is extremely difficult if not absolutely impossible to get all the water out of wood by mere seasoning. We have no doubt that the water which exuded from your sticks was simply expelled by the heat; and was not formed by the combustion of hydrogen.

E. G., of Mass.—You can easily arrange a weight to drive a small machine. The frequency with which it will have to be wound up will depend on the power required to drive the machine, and the size of the weight. A pendulum will regulate the speed of a machine with great precision, but it can add nothing to the power.

L. K., of Ky.—Several correspondents have enquired of us where large plate springs can be obtained. We now understand that Messrs. Hanibal Green & Co,, of Troy, N. Y., can supply such springs.

K., of N. Y.—If you desire to obtain assistance in securing a patent for your mode of preventing dew from forming on show windows, you had better advertise for it in this paper.

P. W. A., of Ohio.—Government has no standing offer for a new motor. The cost of a patent is not affected by the value of an invention. We will send you one of our pamphlets of advice and a circular about foreign patents.

J. D. J., of Pa.—We are not acquainted with any one engaged in the manufacture of oil barrels. Perhaps some manufacturer who sees the notice will advertise them in our paper.

J. S., of Iowa.—The only and best mode of charging a fluid with carbonic acid gas, is by confining the fluid in a tight vessel and admitting the gas to it in the same manner that soda water is charged. Saleratus is made by conveying carbonic acid gas from a furnace having a clear anthracite coal fire, into a close chamber filled with shallow pans on shelves containing the ground soda, which absorbs the gas. The carbonate of soda and potash are neutral salts.

H. G., of Mass.—The solid contents of a cylindrical vessel, the circumference of which is 36 feet and hight 9 feet four inches is equal to 962.57 cubic feet, and the contents of a square vessel each side of which is 9 feet and in hight 9 feet 4 inches is 756 cubic feet.

D. P., of Mass.—You might obtain a patent on your addition to Jone's showing that your patent would be subject to his—that is to say, you would be compelled to make some arrangement with him before you could use his. If it can be shown that your addition to Jone's spring proves of any advantage, we think a patent should be granted for it.

G. R. J.—A wind-mill does very well for pumping water, but for driving a saw it is very unsatisfactory from its inconstancy. If you object to steam perhaps an air engine might answer your purpose.

C. W., of N. Y.—The London *Quarterly Review* attributes the introduction of iron clad war vessels to Robert L. Stevens, of Hoboken, N. J. The origin and earliest date of chambered and centrally perforated projectiles we presume it would be impossible to determine.

W. B., of N. J.—We do not believe that you will find anything better or cheaper than wood for the ball on the carpenter's brace. India rubber is worth about 70 cents per pound, and gutta percha is expensive.

F. N. B., of Wis.—If your boiler is of very good iron it ought to resist a tensile strain of about 60,000 lbs. to the square inch of sectional area ; which would give 3,000 lbs. for each lineal inch for a thickness of .05. The steam in a boiler one foot in diameter would exert a tensile strain on each lineal inch equal to 12 times the pressure per square inch. So your boiler ought to bear a pressure of 250 lbs. to the square inch ; making no allowance for the weakness from riveting.

J. M. K., of Conn.—A musket ball fired vertically from the earth, would fall with the same velocity that it had in its ascent, were it not for the resistance of the air ; but in consequence of this resistance it falls with less velocity.

SPECIAL NOTICE—FOREIGN PATENT.—The population of Great Britain, is 30,000,000 ; of France, 35,000,000 ; Belgium, 5,000,000; Austria, 40,000,000; Prussia, 20,000,000; and Russia, 60,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. Nearly all of the patents secured in foreign countries by Americans are obtained through our agency. Address Munn & Co., 37 Park-row, New York. Circulars about foreign patents furnished free.

Money Received

At the Scientific American Office on account of Patent Office business, during one week preceding Wednesday, Feb. 5, 1862:—

B. B., of O., $15; C. E. S., of Wis., $10; P. J., of N. J., $15; A. J. K., of N. Y., $15; M and T., of N. J., $15; J. H., of L. I., $15; P. D., of Mich., $20; A. D., of N. Y., $15; T. and L., of N. Y., $12; H. G., of N. Y., $15; F. G. L. S., of Wis., $25: C. C. C., of Mass., $30; S. H. N., of Iowa, $15; R. W. G., of Me., $15; N. B., of Ky., $20; J. F. D., of N. Y., $$45; S. J. T., of N. Y., $20; S. G. B., of Conn., $35; H. W., of Vt., $60; A. J. K., of N. Y., $25; C. W., of N. Y., $25; O. R. B., of N. Y., $25; L. B. C., of Conn., $30; A. McG., of N. Y., $25; D. M., of N. Y., $30; E. and G., of Mass., $40; L. K., of N. Y., $15; J. H., of N, Y., $25; M. and A., of Wis., $650; E. C. H., of N. H., $10; O. S., of O., $15; T. S. B., of N. Y., $25; E. C., of N. Y., $15; H. W., of Cal., $15; G. L. S., of N. Y., $25; S. A. B., of R. I., $15; J. W. S., of N. Y., $50; O. E. M., of Ill., $20; F. X. M., of N. Y., $45; G. and P., of Ill., $20; D. L. M., of N. J., $20; J. J. H., of Ky., $20; R. and H., of N. J., $12; H. N., of N. Y., $25; L. P. W., of N. Y., $25; J. P., of N. Y., $25; J. M. H., of Va., $15; B. and S., of N. Y., $25; G. B. O., of N. Y., $15; J. B. L., of Conn., $60; W. B. B., of Mich., $20; W. T. of N. Y., $15; H. S., of England, $40; N. G. C., of N. Y., $25: A. H., of Wis., $15; C. W. I., of N. Y., $15; H. G., of Mass., $15; G. F. J. C., of N. J., $15; S. H., of Ind., $20; T. W., of Ill., $45; B. T. B., of N. Y., $20; W. H. B., of R. [illegible]20; G. B. D., of Ill., $20; J. L., of Mich., $45; C. H. C., of N. Y., $25; S. P., of Del., $25.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Jan. 29 to Wednesday Feb. 5 1862:—

S. G. B., of Conn.; B. and S., of N. Y.; S. P., of Del.; P. D., of Minn.; H. N., of N. Y.; T. S. B., of N. Y.; C. C. C., of Mass.; R. and H., of N. J.; O. R. B., of N. Y.; A. McG., of N. Y.; L. B. C., of Conn.; N. G. C., of N. Y.; J. B. L., of Conn.; C. H. C., of N. Y.; G. S. L., of O.; J. A. W., of N. Y.; W. T., of Mich.; L. P. W., of N. Y.; F. G. L. S., of Wis.; E. and G., of Mass.; G. L. S., of N. Y.; R. H. J., of Ill.; C. W. H., of Conn.; J. H., of N. Y.; C. W., of N. Y.; S. J. D., of Ky.; A. J. K., of N. Y.

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NEW YORK OBSERVER FOR 1862.—IN ASKING the aid of all who may desire to extend the circulation of the *New York Observer*, it is proper for us to state distinctly the position it occupies with reference to the present condition of public affairs in our beloved country.

Having always maintained the duty of good citizens in all parts of the land to stand by the Constitution, in its spirit and letter, when that Constitution was assailed and its overthrow attempted, we accordingly at once gave a cordial support to the Government in its patriotic endeavor to assert its lawful authority over the whole land. Believing secession to be rebellion, and when attempted, as in this case, without adequate reasons, to be the highest crime, we hold

1. That the war was forced upon us by the unjustifiable rebellion of the seceding States.

2. That the Government, as the ordinance of God, must put down rebellion and uphold the Constitution in its integrity.

3. That every citizen is bound to support the Government under which he lives, in the struggle to reëstablish its authority over the whole country.

4. That the Constitution of the United States is the supreme law of the Government as well as of the people; that the war should be prosecuted solely to uphold the Constitution and in strict subordination to its provisions: and the war should be arrested, and peace concluded, just so soon as the people now in revolt will lay down their arms and submit to the Constitution and laws of the land.

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1. It is printed on a double sheet, so as to make two complete newspapers, one devoted to secular and the other religious matters; and these may be separated so as to make two complete journals, while the price for both is no greater than is charged for many papers smaller than either one of the two.

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The state of the country renders it important for us and esirable for the churches, that a new and earnest effort be made to extend the principles of good government and sound religious truth into all the families of the land. In every neighborhood there must be some who do not now take a religious newspaper, and who might with a little exertion be induced to subscribe.

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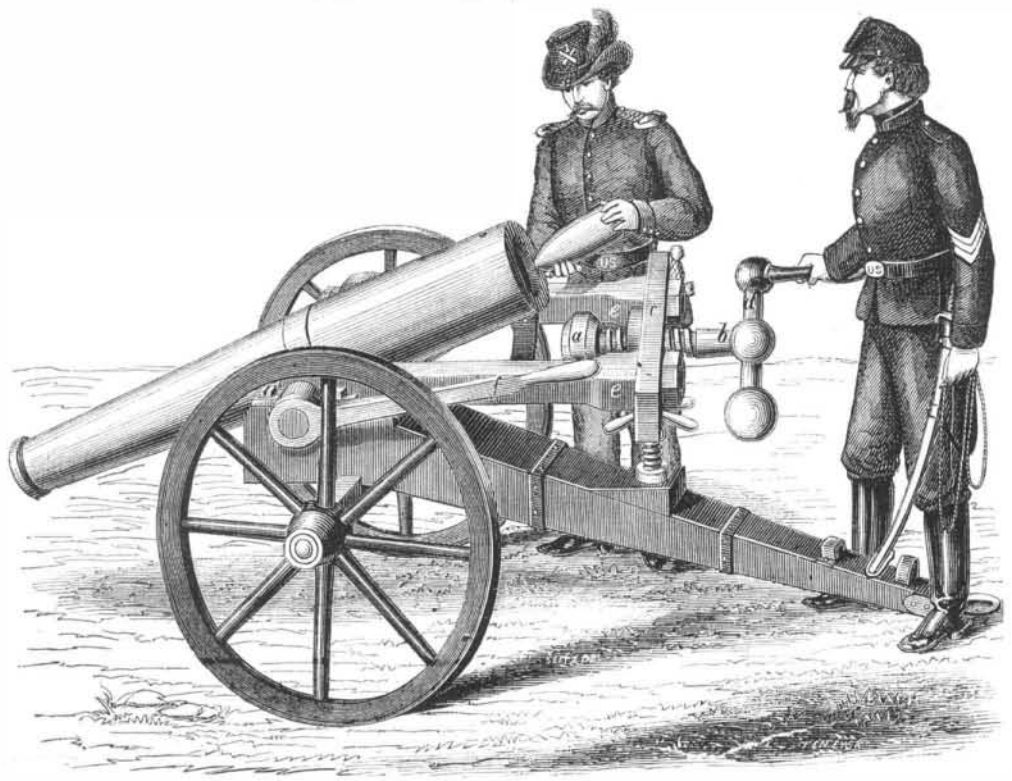
Improved Breech-Loading Cannon.

The accompanying engraving represents one of the latest modifications in breech-loading cannon, and varies in some important particulars from anything that has preceded it. It has a conical breech pin inserted and held in place by a screw, but the screw, instead of having its female thread in the cannon, is passed through a metal bar, which is attached to two massive rods, extending back from the trunnions. Of all plans yet suggested for closing the breech of a cannon, we know of none that prevents the escape of gas except the conical breech pin, pressed in by a screw. This perfect closing of the breech has been the great difficulty with this class of artillery. If there is the slightest leak, the gas in rushing through the orifice will soon enlarge it so as to disable the gun. The arrangement of the several parts of this cannon will be understood by a glance at the cut.



LA BOYTEAUX'S AND DANGERFIELD'S BREECH-LOADING CANNON.

The breech pin, *a*, is made tapering at its forward end, and fits into a chamber in the breech; its conical end pressing against a tapering shoulder at the inner end of the chamber. The breech pin is secured to the end of a stout screw, *b*, which passes through the metal bar, *c*, and has the crank, *d*, upon its outer end. The bar, *c*, is fastened by means of large nuts to the ends of the two rods, *e e*, which are looped at their forward ends to the trunnions of the gun. By turning the screw the breech pin is drawn out, when the breech of the gun is tipped up in the position shown in the cut, and the charge is inserted. The gun is then tipped back into its proper position for firing, and the breech pin is pressed into place by turning the screw in the opposite direction. For tipping the gun the lever, *f*, is keyed firmly to the trunnion, which extends beyond its bearing on the carriage for this purpose.

From the positions of the lever and crank it will be seen that one man can easily work the breech and tip the gun, while two more only are required to work it; one to insert the cartridge and the other to discharge the piece. In case it should become necessary to abandon a gun constructed after this plan it can be easily disabled by simply turning off the nuts and carrying away the breech pin and screw.

The inventor says that he has fired one of these guns five times in a minute, and that three men have fired it fifteen times in a minute.

Application for a patent for this invention has been made through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventor, J. H. La Boyteaux or James Dangerfield, at Jacksonville, Ill.

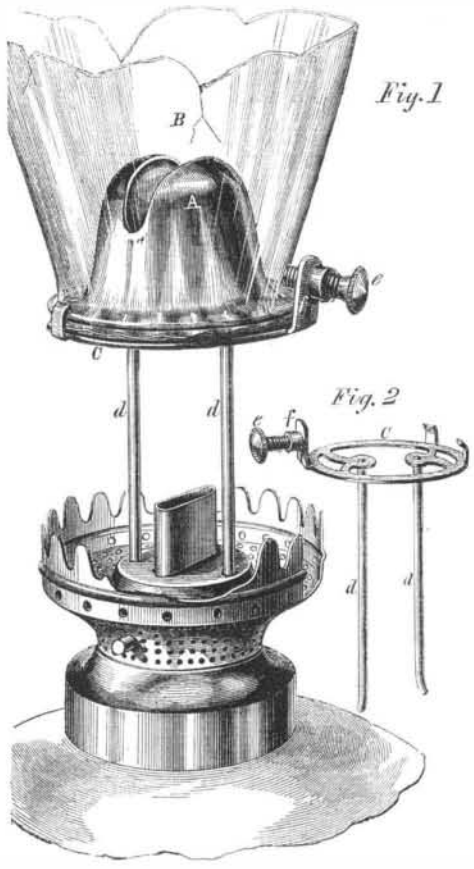
Boiled oats, fried in fat, are recommended for laying hens as the very best food for the production of eggs.

MAYHEW'S PATENT KEROSENE LAMP.

The accompanying engraving illustrates an improved mode of securing chimneys to lamps by means of which the wick is made accessible for trimming or adjusting without the trouble of taking off the hot cone or deflector, as at present practiced.

The deflector, A, and chimney, B, Fig. 1, rest upon a flat ring, C, Fig. 2, and this ring is secured to the lamp by two pendant rods, *d d*, which slide loosely in holes in the lamp top. From this arrangement it will be seen that to render the wick accessible it is only necessary to take hold of the chimney, or of the screw, *e*, and raise both the chimney and deflector clear of the wick; the guide rods, *d d*, securing the return of the parts precisely to their proper places.

The plate, *f*, through which the screw, *e*, passes has considerable elasticity, enabling the screw to yield to any expansion of the glass, and thus prevent the chimney from cracking. This is a very important matter, as a great many chimneys are broken, either by having the screw turned in too tight, or by the expansion of the glass afterward.



The patent glass cone can be used with this improvement, a fact which the inventor regards as of considerable consequence, as he says that the use of the transparent cone is effecting a notable economy in the burning of oil.

This improvement was invented by T. Mayhew; the patent was granted, through the Scientific American Patent Agency, Jan. 7, 1862, and further information in relation to it may be obtained by addressing Mayhew & Barratt, at Poughkeepsie, N. Y., or R. D. Mann, agent, at No. 8 Dey street, New York city.

By repeated experiments with a gunpowder engine, in New York, it was found that eleven grains of fine sporting powder moved 250 pounds a distance of one foot, or one pound, 250 feet. The combustion of the powder was very perfect.

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